GETINGE

PACS 2000

PROGRAMMING MANUAL

VER. 2.09

REV 97C

Click here to EXIT Manual

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INTRODUCTION

PACS 2000 Ver. 2.09

TECHNICAL DATA

Adaptation to line voltage by means of transformer		2 * 18 ±10% VAC, 50 - 60 Hz
Power consumption depending on the degree of extension		< 100 VA
Operating ambient temperature		+10 - +60 ^{o}C
Humidity resistance	control system	90% rel.
	front panels	100% rel.
Water and dust protection of	control system	IP43
	front panel	IP65
Electromagnetic compatibility		FCC 15 J, CIS PR22, EN 50081, EN 50082, IEC 801
PC board performance according to		CSA and UL
Maximum distance between operator panel and control unit		10 m
System sampling rate for all in- and outputs		4 Hz
Type of digital inputs supplied from system		Opto-coupled 24 V DC
Number of digital input modules		Maximum 8
Number of inputs with each module		8
Type of digital outputs		Relays, contact rating 12 A
Number of digital output modules		Maximum 8
Number of digital outputs with each module		8
Number of analog input modules		Maximum 10
Number of analog inputs.-	PACS 2000 alone	Maximum 32
	if PACS Supervisor is connected	Maximum 24

Number and kind of analog inputs with module type:

1. 3 RTD Pt100
   1 pressure
2. 3 thermocouple type K
   1 pressure
3. 6 RTD Pt100
4. 6 thermocouple type K
5. 2 RTD Pt100
   2 pressures
6. 4 general purpose
   - 0 - 20 mA
   - 0 - 5 V
   - 0 - 10 V
   - 4 - 20 mA[*1]

Analog inputs type:

A. Temperature

Sensor	Pt100 4-wire only
Resolution	0,1 ^{o}C
Inaccuracy	±0,1 ^{o}C
Range	-5 - +150 ^{o}C

B. Temperature

Sensor	TC type K, Chromel-Alumel
Resolution	0,1 ^{o}C
Inaccuracy	±0,2 ^{o}C
Range	-5 - +150 ^{o}C

C. Temperature

Sensor	TC type K, Chromel-Alumel
Resolution	0,2 ^{o}C
Inaccuracy	±0,4 ^{o}C
Range	-5 - +800 ^{o}C

D. Pressure

Sensor	Wheatstone bridge
	0 - 500 mV/v
Resolution	0,001 bar(a)
Inaccuracy	±0,01 bar(a) for 0 - 1 bar(a) ±1% of actual value for 1 - 5 bar(a)
Range	0 - 5 bar(a)

E. Pressure

Sensor	Wheatstone bridge
	0 - 300 mV/v
Resolution	0,001 bar(a)
Inaccuracy	±0,001 bar(a)
Range	0 - 1,5 bar(a)

F. General purpose

Sensor	0 - 20 mA, 4 - 20 mA[*1],
	0 - 5 V, 0 - 10 V
Inaccuracy	0,1% of span
Range	As above

G. Scale

Sensor	0 - 20 mA, 4 - 20 mA[*1],
	0 - 5 V, 0 - 10 V
Inaccuracy	0,1% of span
Range	0 - 500 kg

H. Concentration

Sensor	0 - 20 mA, 4 - 20 mA[*1],
	0 - 5 V, 0 - 10 V
Inaccuracy	0,1% of span
Range	0 - 1200 mg/l

Analog outputs	0 - 20 mA, 4 - 20 mA, 0 - 5 V, 0 - 10 V Resolution 0,4% Activation rate 4 Hz
Number of analog output modules	Maximum 4
Number of analog outputs with each module	2

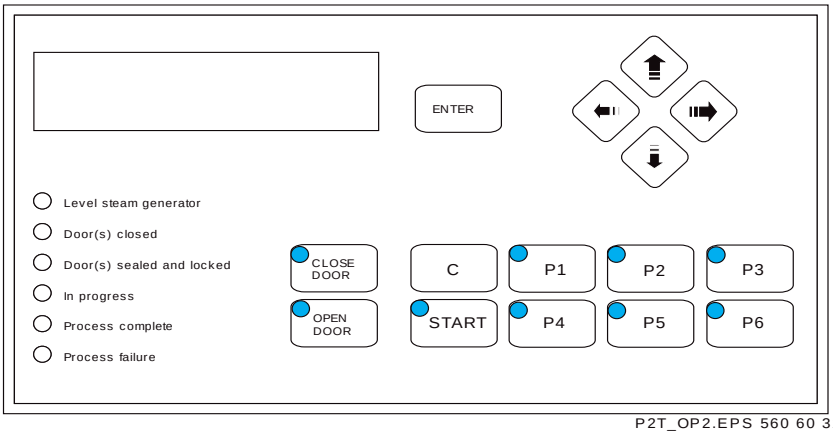
*1. All four inputs on the module will be set for 4 - 20 mA when this alternative is used.

OPERATOR PANELS

OP 1

OP 1is the smallest operator panel which can include up to eight LED's and two push buttons. It communicates with the PACS 2000 via an 90 kbit/s, long distance, I2C bus with a maximal length of 10 meters. Up to two OP 1's may be connected to the PACS 2000.

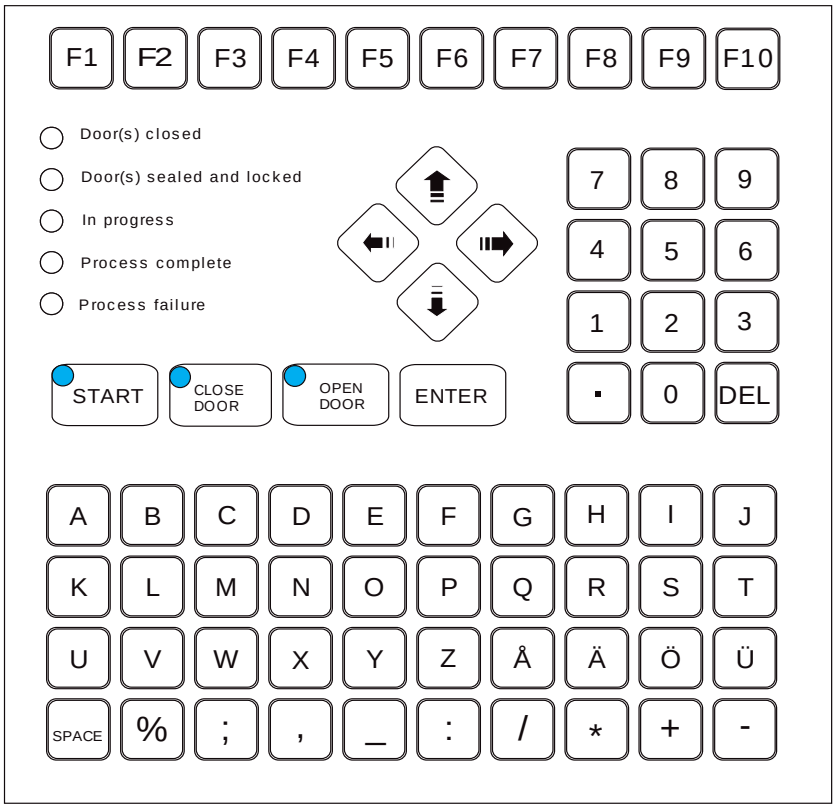
OP 2.



OP 2

OP 2 can include up to 16 LED's and 15 push buttons. The status of the LED's are set by the program in PACS 2000 and sent to OP 2. The status of the first 10 push buttons, 0-9, are read by the Boolean program. The remaining 5 buttons are for menu stepping and data entering. OP 2 communicates with the PACS 2000 via an 90 kbit/s, long distance, I2C bus with a maximal length of 10 meters. Up to two OP 2's may be connected to the PACS 2000

OP 3

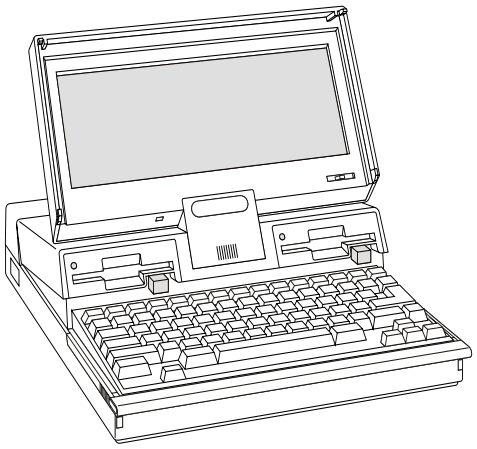


P2T_OP3.EPS 560 60 41

OP 3

OP 3 is a panel built on a PC/XT-chipset hardware with a large LCD-display. The panel is intended to be used for program execution and program altering. OP 3 has normally no hard disk or floppy drive. OP 3 can be equipped with an external floppy drive as option. Two separate keyboards may be connected. The standard OP 3 membrane keyboard or a PC/XT keyboard. OP 3 communicates with the PACS 2000 via a standard RS232 serial interface connected as COM1. COM2 may be used for connecting a printer or a PROM programmer.

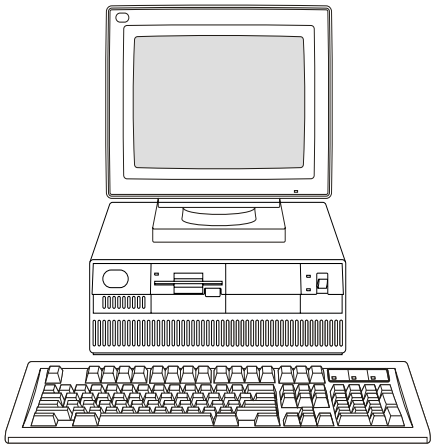
OP C



OP C

OP C is a standard IBM compatible PC with DOS and with backup utilities on harddisk and floppy. OP C is intended to be used for program development. The menu tree is identical to OP 3 but OP C also includes menus for loading data on diskette or hard disk. OP C communicates with the PACS 2000 via a standard RS232 serial interface connected as COM1. COM2, if installed, may be used for connecting a printer or a PROM programmer. In Local mode it is possible to run the program without any PACS connected.

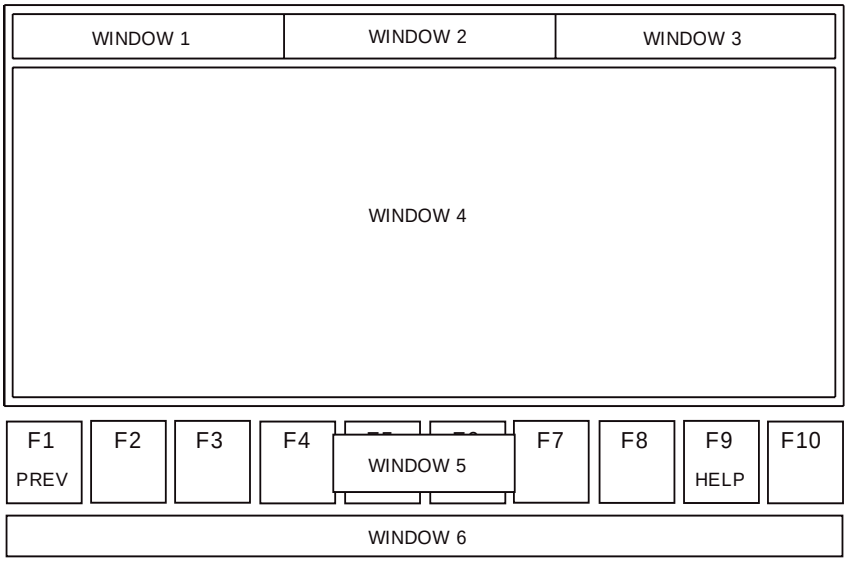
OP H



OP H

OP H is identical to OP C with the extension that it can be connected to a network including more the one PACS. OP H communicates with the PACS 2000 via a standard RS485 serial interface. OP H is communicating with one PACS at a time.

SCREEN LAYOUT



PACS 2000 Screen windows

The screen is divided into six windows to display different kind of information.

1. Window 1 shows system date and time on OP 3 and OP C while OP H shows name and number of connected sterilizer.
2. Window 2 shows sequence number and symbolic name for active PACS program in on-line mode. The window is showing the version number of the program in local mode.
3. Window 3 shows symbolic name and subphase number for active PACS phase in on-line mode. In local mode the text ”LOCAL MODE” is shown.
4. Window 4 All menu functions in the OP-menu tree are performed in this window. The active menu headline is written in the upper left corner of the window.
5. Window 5 describes active functions for **F1 -F10**. Function key **F9** shows a help text specific for the active menu.
6. Window 6 is used for menu handling messages. In process pictures the left part of the window is used for PACS error text and the right part for PACS information text.

PASSWORDS

CAUTION! Change the passwords before putting the unit into operation (See “SYSTEM CONFIGURATION” on page 69.). Remember that programming the PACS 2000 could cause severe accidents if carried out by unqualified personnel. Do not give away level 4 password to anyone that has not been thoroughly trained in programming.

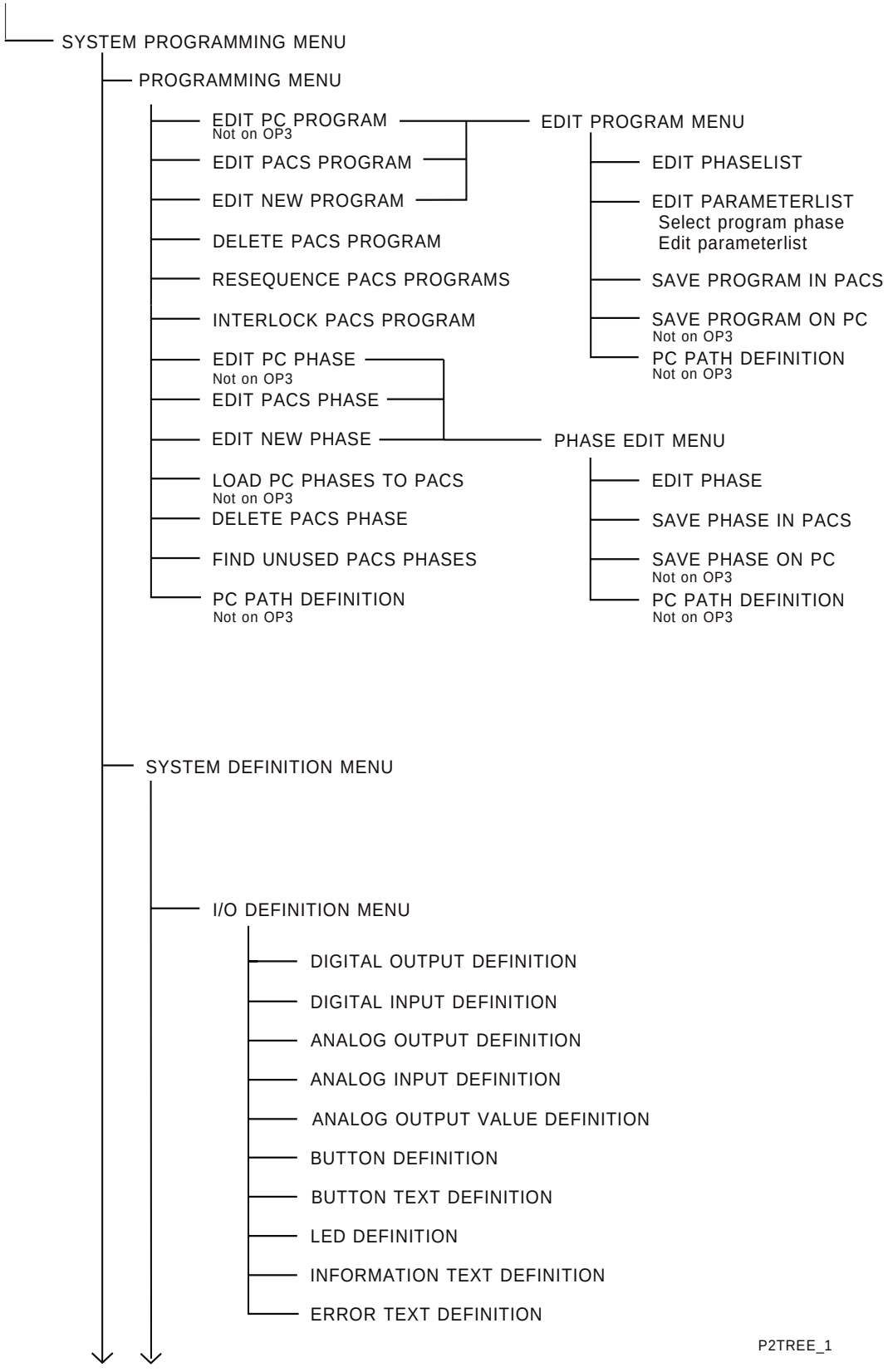
Four passwords exists in the PACS 2000 and consists of four digits 0000-9999. The passwords are

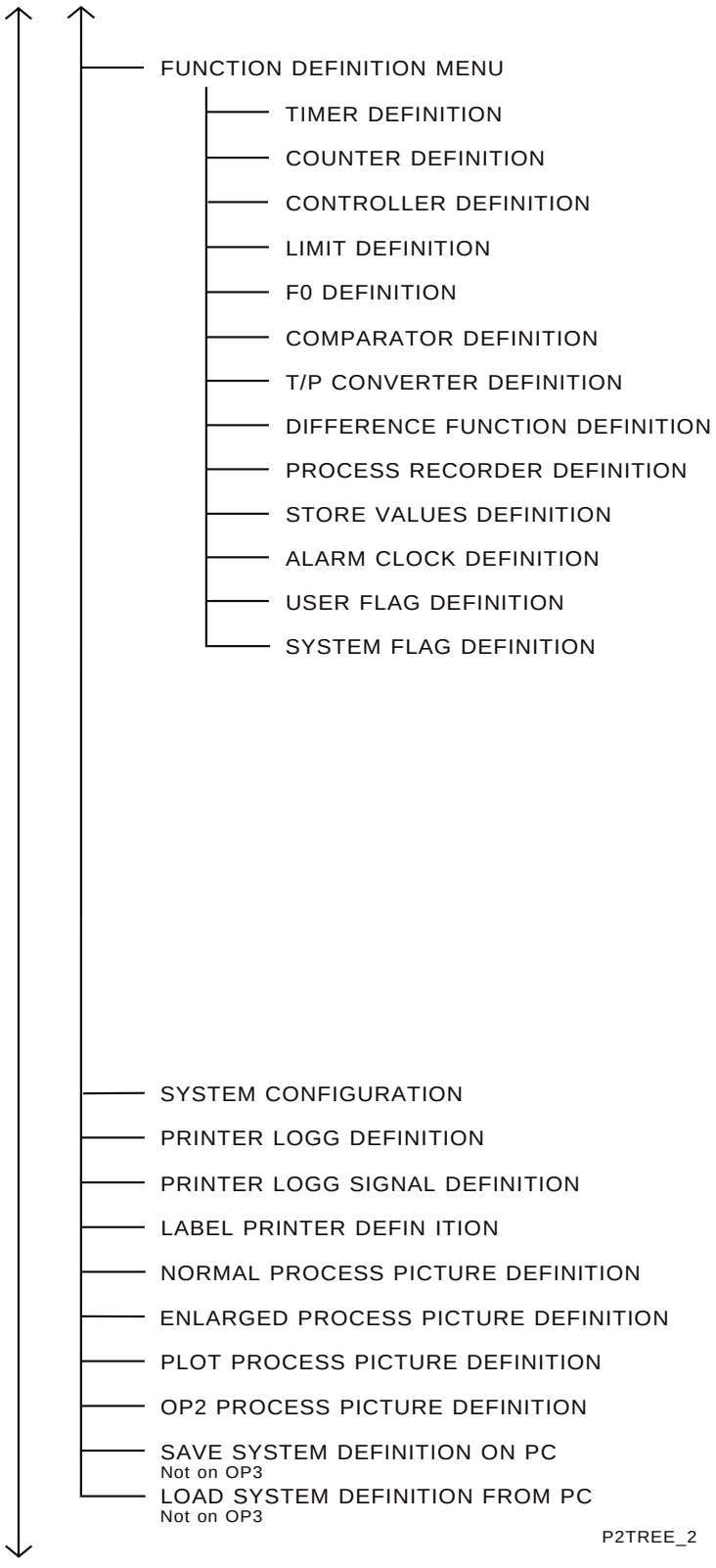
- operator password
  needed to start restricted programs and to open the door after a process failure.
- parameter password
  needed to accept change of program parameters in OP 2/OP 3/OP C/OP H.
- service password
  needed for entering maintenance menus in OP 2/OP 3/OP C/OP H.
- program password
  needed for entering programming menus in OP 3/OP C/OP H.

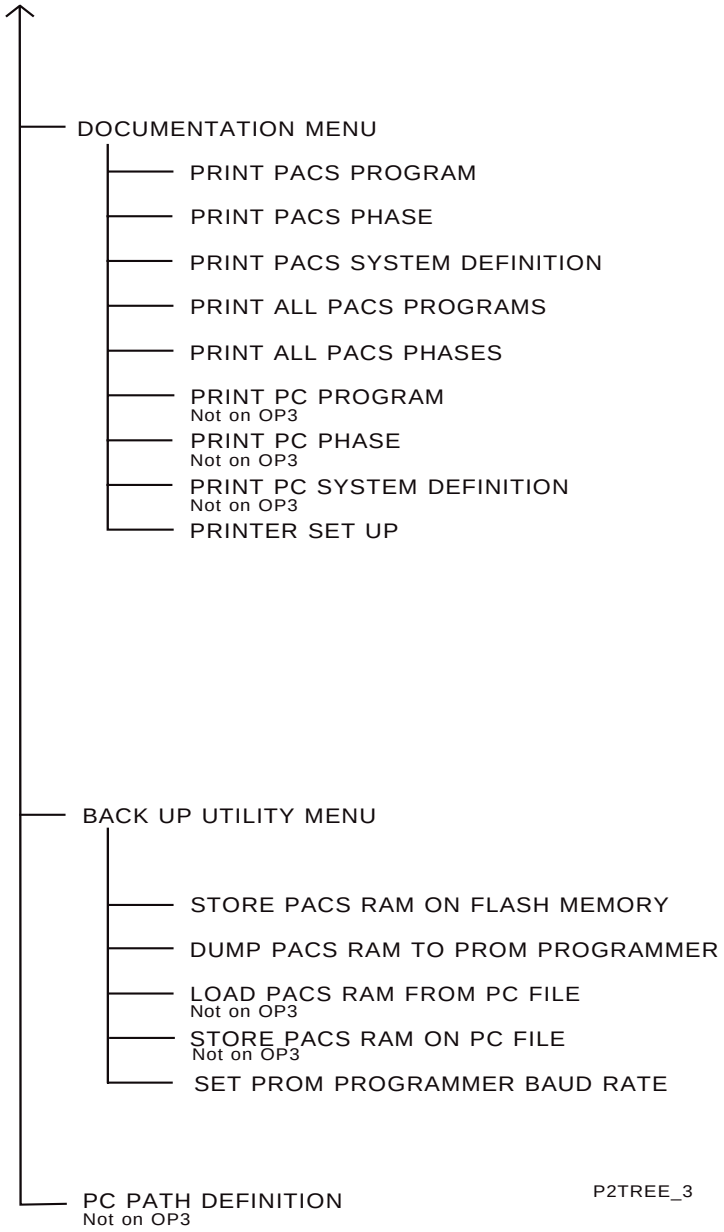
The operator password is activated by the Boolean program.

The parameter password may be exchanged to a pass key connected to a digital input. The digital input number DI00-DI47 is entered in the menu. The default DI-1 indicates that no pass key is valid. The pass key overrides the parameter password.

MENU TREE


SYSTEM PROGRAMMING MENU
PROGRAMMING MENU
EDIT PC PROGRAM
Not on OP3
EDIT PACS PROGRAM
EDIT NEW PROGRAM
DELETE PACS PROGRAM
RESEQUENCE PACS PROGRAMS
INTERLOCK PACS PROGRAM
EDIT PC PHASE
Not on OP3
EDIT PACS PHASE
EDIT NEW PHASE
LOAD PC PHASES TO PACS
Not on OP3
DELETE PACS PHASE
FIND UNUSED PACS PHASES
PC PATH DEFINITION
Not on OP3
EDIT PROGRAM MENU
EDIT PHASELIST
EDIT PARAMETERLIST
Select program phase
Edit parameterlist
SAVE PROGRAM IN PACS
SAVE PROGRAM ON PC
Not on OP3
PC PATH DEFINITION
Not on OP3
PHASE EDIT MENU
EDIT PHASE
SAVE PHASE IN PACS
SAVE PHASE ON PC
Not on OP3
PC PATH DEFINITION
Not on OP3
SYSTEM DEFINITION MENU
I/O DEFINITION MENU
DIGITAL OUTPUT DEFINITION
DIGITAL INPUT DEFINITION
ANALOG OUTPUT DEFINITION
ANALOG INPUT DEFINITION
ANALOG OUTPUT VALUE DEFINITION
BUTTON DEFINITION
BUTTON TEXT DEFINITION
LED DEFINITION
INFORMATION TEXT DEFINITION
ERROR TEXT DEFINITION
P2TREE_1


FUNCTION DEFINITION MENU
TIMER DEFINITION
COUNTER DEFINITION
CONTROLLER DEFINITION
LIMIT DEFINITION
F0 DEFINITION
COMPARATOR DEFINITION
T/P CONVERTER DEFINITION
DIFFERENCE FUNCTION DEFINITION
PROCESS RECORDER DEFINITION
STORE VALUES DEFINITION
ALARM CLOCK DEFINITION
USER FLAG DEFINITION
SYSTEM FLAG DEFINITION
SYSTEM CONFIGURATION
PRINTER LOGG DEFINITION
PRINTER LOGG SIGNAL DEFINITION
LABEL PRINTER DEFIN ITION
NORMAL PROCESS PICTURE DEFINITION
ENLARGED PROCESS PICTURE DEFINITION
PLOT PROCESS PICTURE DEFINITION
OP2 PROCESS PICTURE DEFINITION
SAVE SYSTEM DEFINITION ON PC
Not on OP3
LOAD SYSTEM DEFINITION FROM PC
Not on OP3
P2TREE_2


DOCUMENTATION MENU
PRINT PACS PROGRAM
PRINT PACS PHASE
PRINT PACS SYSTEM DEFINITION
PRINT ALL PACS PROGRAMS
PRINT ALL PACS PHASES
PRINT PC PROGRAM
Not on OP3
PRINT PC PHASE
Not on OP3
PRINT PC SYSTEM DEFINITION
Not on OP3
PRINTER SET UP
BACK UP UTILITY MENU
STORE PACS RAM ON FLASH MEMORY
DUMP PACS RAM TO PROM PROGRAMMER
LOAD PACS RAM FROM PC FILE
Not on OP3
STORE PACS RAM ON PC FILE
Not on OP3
SET PROM PROGRAMMER BAUD RATE
PC PATH DEFINITION
Not on OP3
P2TREE_3

MENU DESCRIPTIONS

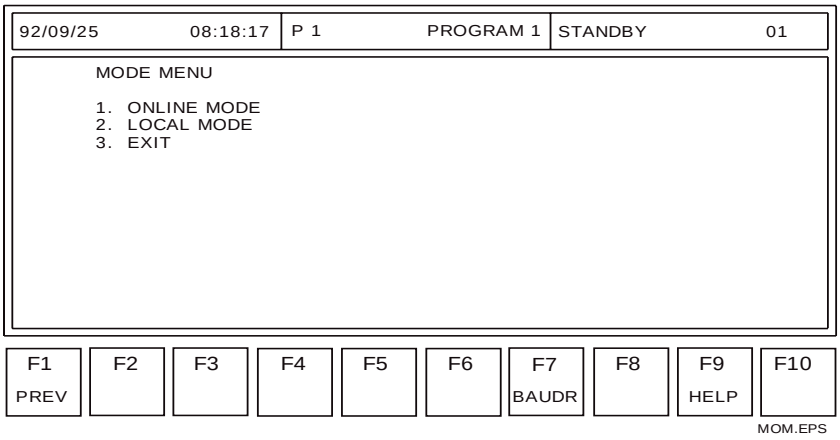
START MENUS

MODE MENU (OP C and OP H only)

In this menu the operator can choose which mode the OP should work in. ON-LINE MODE for connection with PACS 2000 or LOCAL MODE for stand alone operation.

Alternative 3 in the menu terminates the program and returns to DOS.

For OP H and OP C version this is the first menu shown after power-up. This menu is not available in version OP 3. OP 3 can only be terminated with RESET.



Mode menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**. A alternative can also be highlighted by pressing the number of the desired alternative.

Before ON-LINE MODE is activated PACS 2000 communication baud rate can be altered. **F7** shows a window were the operator can choose between the alternatives 1200, 2400, 4800 and 9600 via a choice list. Default value is 9600 baud.

Valid only for OP H: If ON-LINE MODE is chosen a window is shown where the operator can specify which sterilizer he like to be connected to. Allowed values are: 1 - 99.

ON-LINE / LOCAL MODE
OP can operate in two modes, ON-LINE MODE and LOCAL MODE. In ON-LINE MODE the communication link between OP and PACS 2000 is activated and the databases in the two units contains identical

data. In LOCAL MODE OP works without any communication to PACS.

LOCAL MODE is available on version OP H and OP C while OP 3 always requires ON-LINE MODE.

Following menu functions are not available in LOCAL MODE:

- START PROGRAM and all underlying menus.
- CALIBRATION MENU and all underlying menus.
- ERROR LOGG
- TEST ANALOG INPUT
- TEST ANALOG OUTPUT
- TEST DIGITAL INPUT
- TEST DIGITAL OUTPUT
- TEST USER FLAG
- TEST SYSTEM FLAG
- TESTPICTURE
- TEST LED
- EDIT PACS PROGRAM
- SAVE PROGRAM IN PACS
- DELETE PACS PROGRAM
- RESEQUENCE PACS PROGRAM
- INTERLOCK PACS PROGRAM
- EDIT PACS PHASE
- SAVE PHASE IN PACS
- LOAD PC PHASES TO PACS
- DELETE PACS PHASE
- PRINT PACS PROGRAM
- FIND UNUSED PACS PHASES
- PRINT PACS PHASE
- PRINT PACS SYSTEM DEFINITION
- PRINT ALL PACS PROGRAMS
- PRINT ALL PACS PHASES
- BACKUP UTILITY MENU and all underlying menus.

Following menu function is only available in LOCAL MODE:

- PRINT PC SYSTEM DEFINITION

STAND-BY MODE
No process is executed when the PACS 2000 is in stand-by mode.

OP-menus requiring PACS 2000 in STAND-BY MODE are:

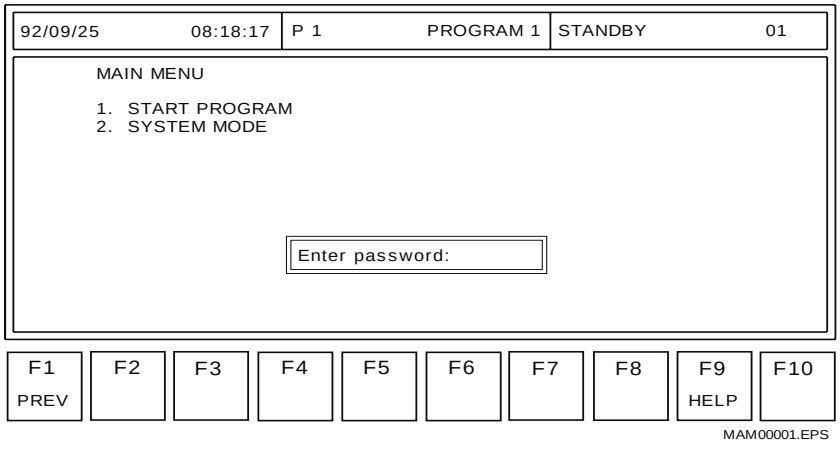
- LOAD SYSTEM DEFINITION FROM PC
- DOCUMENTATION MENU and all underlying menus.
- BACKUP UTILITY MENU and all underlying menus.

Function keys:
F1 PREV - Previous menu

F7 BAUDR - Activate PACS 2000 baud rate window

F9 HELP - Help text

MAIN MENU



Main menu

The operator can choose between the two alternatives START PROGRAM and SYSTEM MODE in MAIN MENU.

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

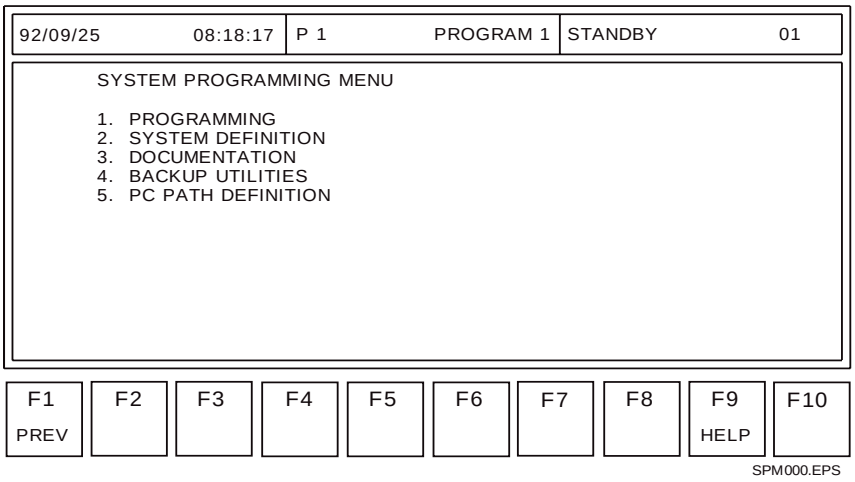
START PROGRAM can only be activated in ON-LINE MODE. To activate SYSTEM MODE the operator must enter a password. Entered characters are echoed as #. If the password is rejected a message is shown in Window 6.

Select SYSTEM MODE and enter level 3 password to get to SYSTEM PROGRAMMING MENU.

Function keys:
F1 PREV- Previous menu

F9 HELP - Help text

SYSTEM PROGRAMMING MENU



System programming menu

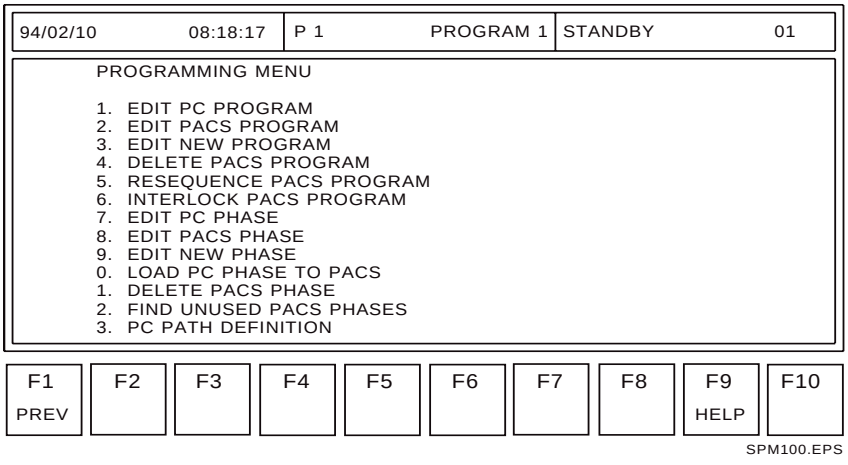
An alternative is highlighted with ⇧⇩ and selected with **ENTER**. *Alternative 4 can not be activated in LOCAL MODE.*

The PACS 2000 must be in STAND-BY MODE in order to activate alternative 3 and 4.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

PROGRAMMING MENU



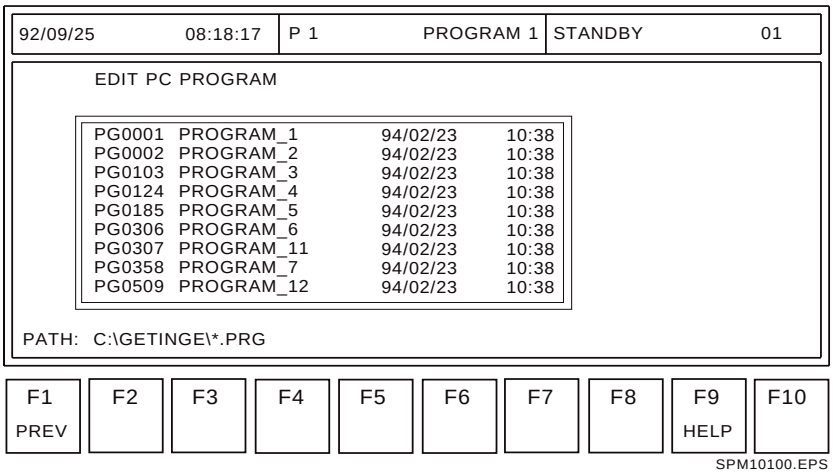
Programming menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**. Alternative 2, 4, 5, 7 and 9 can not be activated in LOCAL MODE.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

EDIT PC PROGRAM



Edit PC program menu

In this menu the operator can select a program stored on disk for alteration.

A list of found program files is shown in a scrollable window. The active FETCH PC PATH is shown in the lower left corner of WINDOW 4. The FETCH PC PATH is defined in the menu PC PATH DEFINITION.

A file is highlighted with ⇧⇩ and selected with **ENTER**. The program goes to EDIT PROGRAM MENU (See page18) after selection of a PACS 2000 program.

Function keys:
F1 PREV - Abort selection

F9 HELP - Help text

EDIT PACS PROGRAM

In this menu the operator can select a program stored in PACS 2000 for alteration. PACS 2000 program directory is shown as a scrollable list.

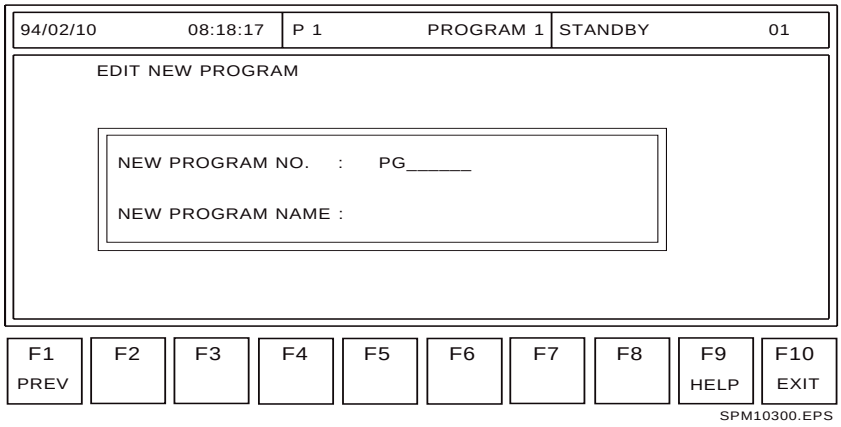
A program is highlighted with ⇧⇩ and selected with **ENTER**.

The program goes to EDIT PROGRAM MENU (See page18)after selection of a PACS program.

Function keys:
F1 PREV - Abort selection

F9 HELP - Help text

EDIT NEW PROGRAM



Edit new program menu

This menu specifies number and name for the creation of a new program.

NEW PROGRAM NO is a numeric field and accepts only input of the digits 0 - 9. The program number must be within the range 0000 - 9999.

NEW PROGRAM NAME is a alphanumerical field that is16 characters long.

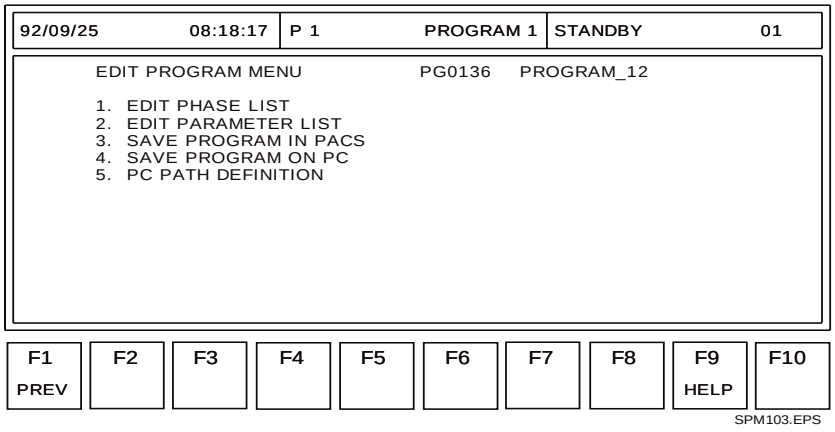
Both fields must contain at least one character each before the operator can leave the menu with **F10**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

F10 EXIT - Go to EDIT PROGRAM MENU

EDIT PROGRAM MENU



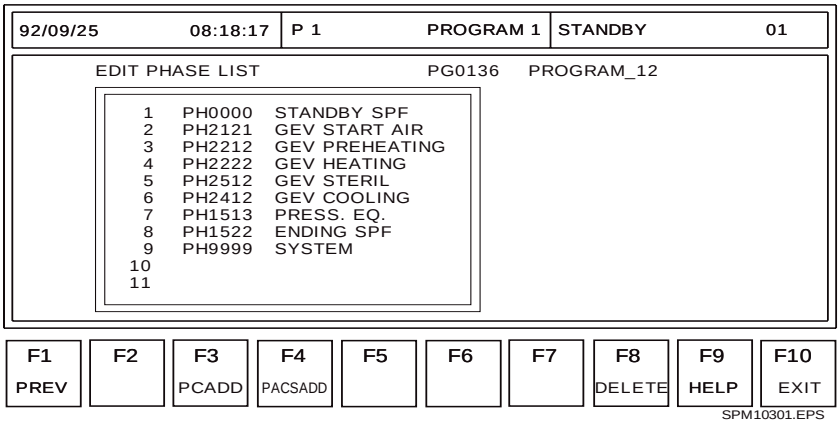
Edit program menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**. Name and number of the selected program is shown on same row as the headline.

Function keys:
F1 PREV - Go to PROGRAMMING MENU (See Page 16)

F9 HELP - Help text

EDIT PHASELIST



Edit phase list menu

In this menu the phase list for the selected program is created or changed. The phase list is shown in a scrollable window that contains max. 30 phases.

Name and number of the selected program is shown on the same row as the headline.

A new phase can be added to the phase list from the PACS 2000 phase directory or from a PC disk directory (only available with OP C and OP H).

- **F3** displays a list of phases available on disk in a window to the right of the phase list. Active PC-path is shown under the phase list. A phase can be highlighted with ⇧⇩ and added to phase list with **ENTER**.
- **F4** displays a list of phases currently stored in PACS 2000 in a window to the right of the phase list. A phase can be highlighted with ⇧⇩ and added to phase list with **ENTER**.
- **F8** deletes the phase currently highlighted from phase list.
- **F10** OP counts the total number of parameters in the phase list when the operator exits the menu. A program is only allowed to contain 120 parameters. If this limit is exceeded an error message is shown on line 25.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 PCADD - Add phase from PC

F4 PACSADD- Add phase from PACS

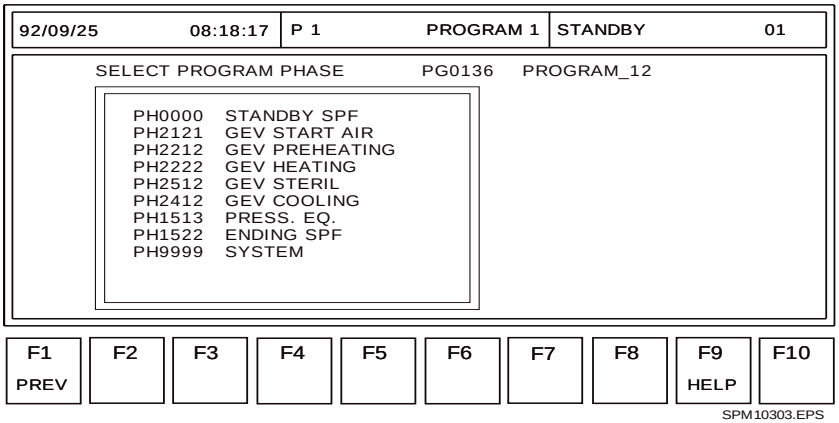
F8 DELETE - Delete phase

F9 HELP - Help text

F10 EXIT - Go to EDIT PROGRAM MENU (See page18)

EDIT PARAMETERLIST

SELECT PROGRAM PHASE



Select program phase menu

The program parameter list is updated phase by phase. In this menu the operator choose one phase from the selected program phase list for parameter edit.

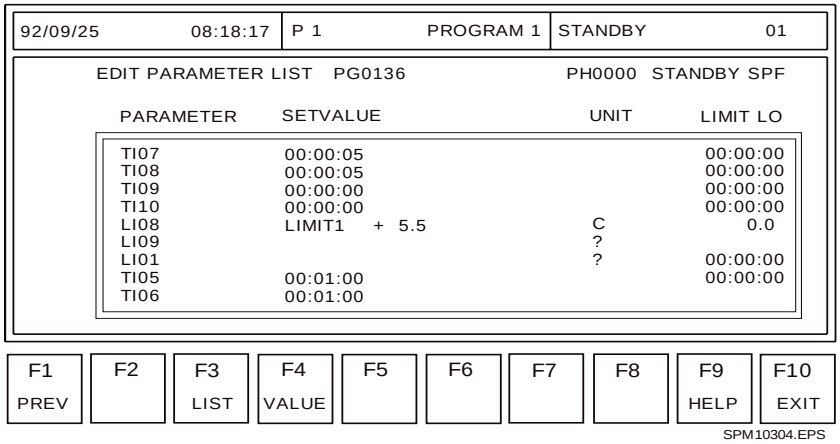
Name and number of the selected program is shown on the same row as the headline. The phase list for the selected program is shown in a window.

A phase is highlighted with ⇧⇩ and selected with **ENTER**. After selection of a phase the program goes to EDIT PARAMETERLIST.

Function keys:
F1 PREV - Abort selection

F9 HELP - Help text

EDIT PARAMETER LIST



Edit parameter list menu.
The columns LIMIT HI and TYPE are to the right of the right screen border and therefore not shown.

This menu is horizontally scrollable and specifies the parameters for the selected phase. Program dependent parameters exists for LIMIT, TIMER, CONTROLLER, CONTROLLER RAMP and COUNTER functions.

A parameter is specified by SET-VALUE, LIMIT LOW, LIMIT HIGH and PARAMETER TYPE. UNIT field depends on settings made under FUNCTION DEFINITION MENU (See Page 43) and cannot be changed in this menu. Number and name of the selected program and the selected phase is shown in the same row as the headline.

SET-VALUE FIELDS

Set-value is specified in three fields, two operands and one operator. Operand fields may contain a variable or a constant value.

F3 shows a choice list of variables available when the cursor is in a operand field. The following alternatives exists.

PARAMETER	ALTERNATIVES
Timer	TI
Counter	CT
Limit	LI, CR, SV, TP
Controller	CR, LI, SV, AI, TP
Controller ramp	CR

TI, CT, LI and CR are chosen from selected program parameter list. SV, AI and TP are chosen from system definition database.

F4 shows a window for constant value input when the cursor in a

operand field. Formats and limits for constant value input are as below.

PARAMETER	ALTERNATIVES
Timer	00:00:00 - 99:59:59 HH:MM:SS
Counter	0 - 65535
Limit	as input sensor
Controller	as Actual value
Controller Ramp	as Actual value

If the operator field is *(mult) or /(div) the constant value input for the second operand field is limited to 0.0 -999.9

OPERATOR field is filled via a choice list with the alternatives +(plus), -(minus), *(mult) and /(div). For Timers only + and - are available. A choice list is activated with **F3** when cursor in a operator field.

LIMIT FIELDS
Limit fields defines the limits for adjustable parameters shown in the menu PARAMETER INPUT.

Formats and limits for LIMIT specification are as below:

PARAMETER	INPUT LIMITS
Timer	00:00:00 - 99:59:59 HH:MM:SS
Counter	0 - 65535
Limit	as input sensor
Controller	as Actual value
Controller Ramp	as Actual value

TYPE FIELD
A parameter can be one of three types. Via a choice list, activated by **F3**, the operator can choose between the alternatives -(passive), **A**(adjustable) and **I**(indicate). Adjustable parameters can be changed by the operator, are both shown in NORMAL PROCESS PICTURE 1 and printed. Indicated parameters are not possible for the operator to change but are shown in NORMAL PROCESS PICTURE 1 and printed. A- and I type parameters are both shown on OP 2.

OTHERS
Units for LIMIT and CONTROLLER functions are defined by connected input sensor. If no sensor is connected this is indicated with '**?**' in the unit field. SET-VALUE field and LIMIT field are also left out. Defined SET-VALUE variables that don't have any symbolic name defined in the database have a ”?” displayed in the UNIT field.

If a second operand is defined but no operator specified then the sec-

ond operand is ignored by the system.

Parameter for CONTROLLER RAMP is only shown if a ramp is specified. The unit for a CONTROLLER RAMP is /MIN.

Function keys:
F1 PREV - Previous menu

F3 LIST - Show active choice list

F4 VALUE - Active constant value input

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Go to EDIT PROGRAM MENU (See page18)

SAVE PROGRAM IN PACS

This menu saves the selected program in the PACS. Name and number of the active program is shown on the same row as the headline.

PROGRAM NO is a numeric field and accepts only input of the digits 0 - 9. The program number must be within the range 0000 - 9999. The field is initialized with the number of the selected program and is not allowed to be left blank.

PROGRAM NAME is a 16 character long string. The field is initialized with the name of the selected program and is not allowed to be left blank.

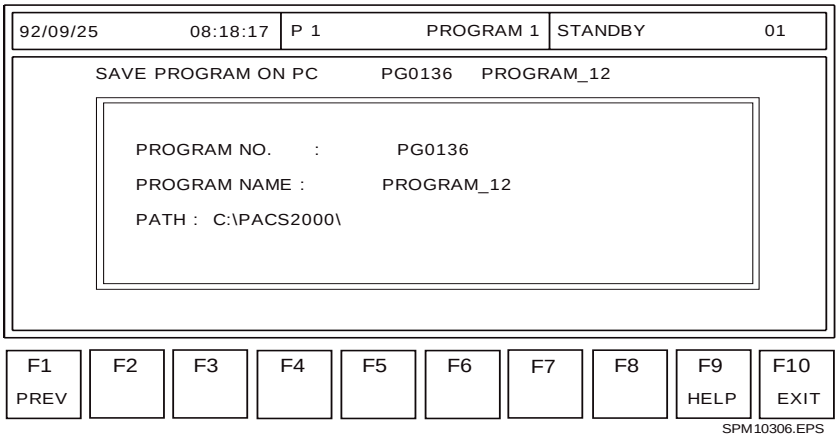
Save is activated with **F10**.
If the program number already exists in the PACS 2000 that program will be overwritten without warning.

Function keys:
F1 PREV - Abort storage

F9 HELP - Help text

F10 EXIT - Activate storage

SAVE PROGRAM ON PC



Save program on PC menu

This menu saves the selected program on a disk file. The file is stored under a name with the format PGxxxx.PRG where xxxx is the program number. Name and number of the selected program is shown on the same row as the headline.

PROGRAM NO is a numeric field and accepts only input of the digits 0 - 9. The field is initialized with the number of the selected program and is not allowed to be left blank.

PROGRAM NAME is a 16 character long string stored first in the file. The field is initialized with the name of the selected program and is not allowed to be left blank.

PATH is a 60 character long field that specifies the directory where the file should by stored. The PATH field is initialized to the same string as in STORE PC PATH in the menu PC PATH DEFINITION (See Page 86). If PATH is changed in this menu it don't affect any field in PC PATH DEFINITION menu.

Save is activated with **F10**. If the file name already exists on disk a message is shown on screen. The operator can choose to overwrite existent file or to change file name i.e. program number.

Function keys:
F1 PREV - Abort storage

F9 HELP - Help text

F10 EXIT - Activate storage

DELETE PACS PROGRAM

This menu makes it possible to delete programs stored in PACS.

The PACS 2000 program directory is shown in a scrollable list. A program is highlighted with ⇧⇩ and deleted with **F8**.

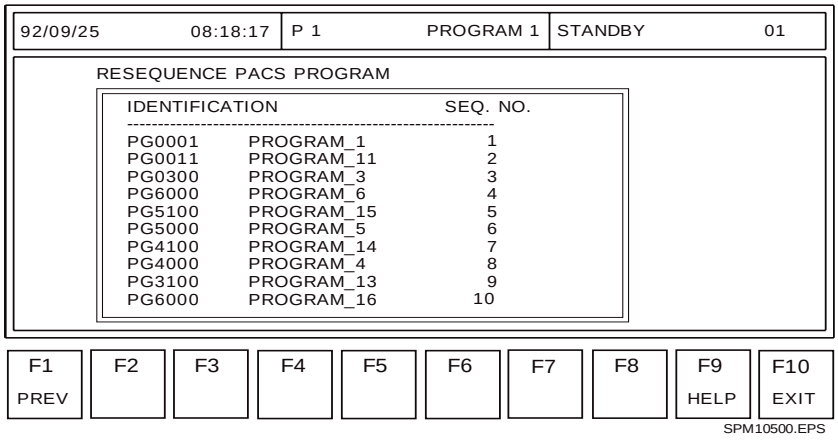
Make sure that the highlighted program is the one you want to delete. There is no ”undo” when you have pressed **F8**.

Function keys:
F1 PREV - Previous menu

F8 DELETE - Delete highlighted program

F9 HELP - Help text

RESEQUENCE PACS PROGRAM



Resequence PACS program menu

This menu makes it possible to change the sequence number of programs stored in the PACS 2000.

The function is used to change the order in which the programs appear in the menu ACTIVATE PROGRAM (See USER MANUAL). PACS 2000 programs are listed by sequence number. The programs with sequence numbers one to five can be selected with function keys.

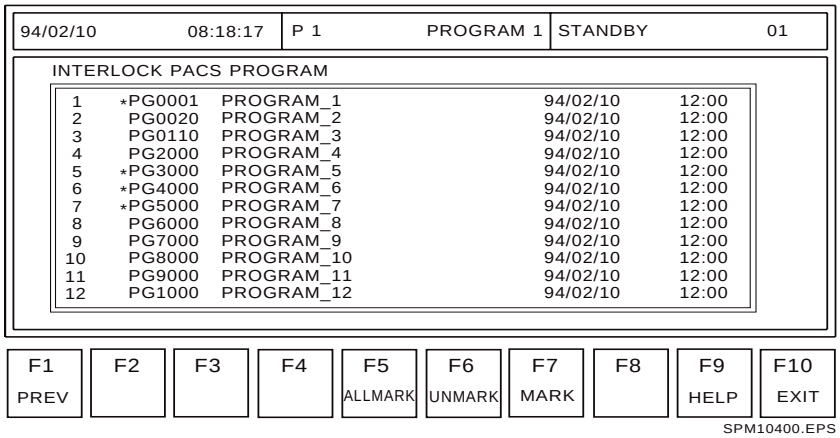
The PACS 2000 program directory is shown in a scrollable list where the SEQUENCE NUMBER field can be changed. The numbers 1 - 64 are accepted and no sequence number may exist more than once.

Function keys:
F1 PREV - Abort menu and ship all changes

F9 HELP - Help text

F10 EXIT - Go to EDIT PROGRAM MENU (See page18)

INTERLOCK PACS PROGRAM



SPM10400.EPS

Interlock PACS program menu

In this menu the operator can make a program interlocked for changes. If a program is interlocked, the phase list, all phases in the phase list, the parameter list and the system definition are write protected.
An interlocked program is marked with * in this menu.

Function keys:
F1 PREV - Abort changes and leave menu

F5 ALLMARK - Mark all programs for interlocking

F6 UNMARK - Remove the interlock marking for actual program

F7 MARK - Mark actual program for interlocking

F9 HELP - Help text

F10 EXIT - Activate interlocking of selected programs and leave menu

EDIT PC PHASE

In this menu the operator can select a phase stored on disk for alteration. A list of found phase files is shown in a scrollable window. Under the window the selected FETCH PC PATH is shown. FETCH PC PATH is defined in the menu PC PATH DEFINITION (See Page 86).

A file is highlighted with ⇧ ⇩ and selected with **ENTER**. After selection of a phase the program goes to PHASE EDIT MENU (See page28).

Function keys:
F1 PREV - Abort selection

F9 HELP - Help text

EDIT PACS PHASE

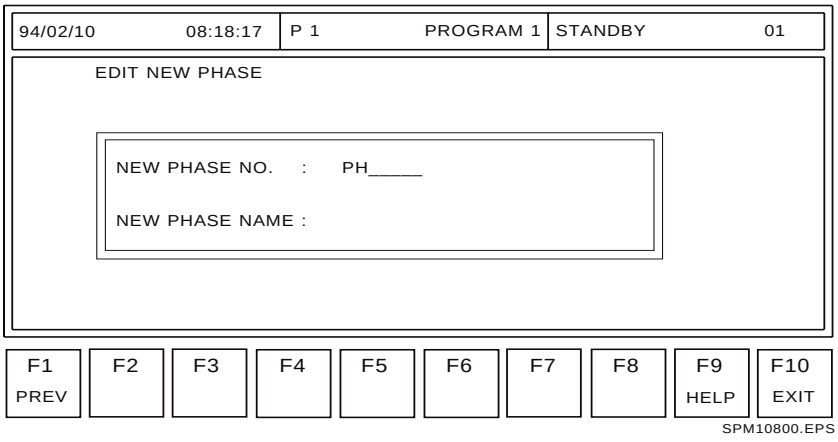
In this menu the operator can select a phase stored in PACS 2000 for alteration.

PACS 2000 phase directory is shown in a scrollable list. A phase is highlighted with ⇧⇩ and selected with **ENTER**. After selection the program goes to PHASE EDIT MENU (See page28).

Function keys:
F1 PREV - Abort selection

F9 HELP - Help text

EDIT NEW PHASE



Edit new phase menu

This menu specifies number and name for the creation of a new phase.

NEW PHASE NO is a numeric field and accepts only input of the digits 0 - 9.

NEW PHASE NAME is a alphanumerical field that is16 characters long.

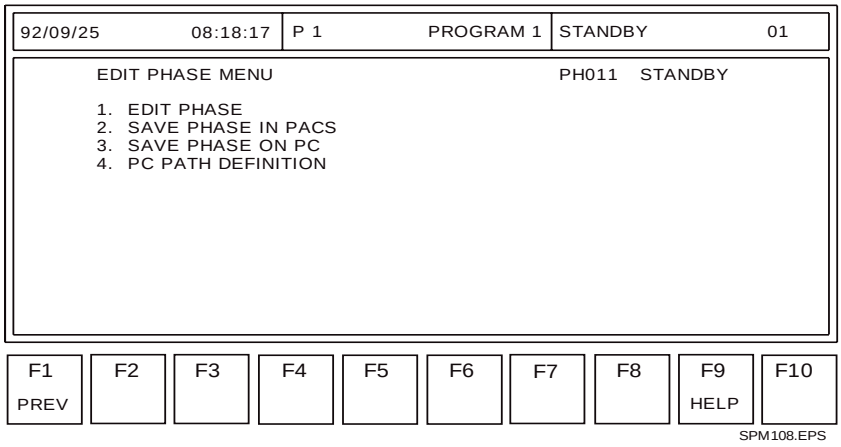
Both fields must contain at least one character each before the operator can leave the menu with **F10**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

F10 EXIT - Go to PHASE EDIT MENU (See page28)

PHASE EDIT MENU



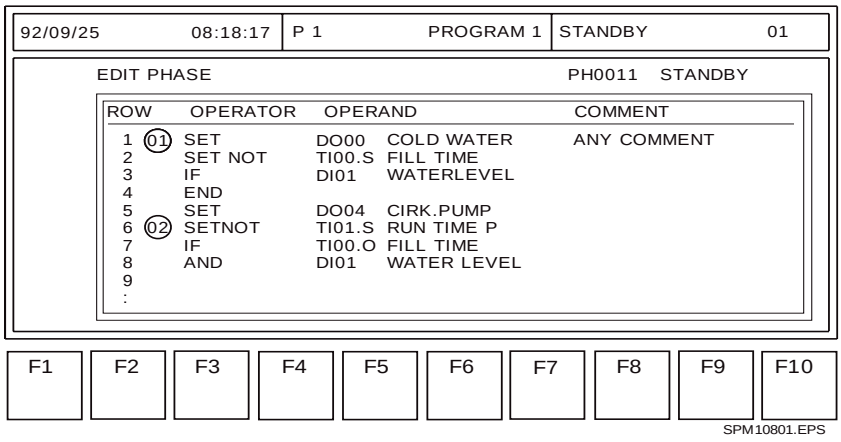
Edit phase menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**. Name and number of the selected phase is shown on the same row as the headline.

Function keys:
F1 PREV - Go to PROGRAMMING MENU (See page16)

F9 HELP - Help text

EDIT PHASE



Edit phase
Function keys are explained in the text.

The phase code editor is shown in a scrollable window that contains 150 rows. A phase code row is defined by OPERATOR, OPERAND and COMMENT fields. The COMMENT field is only saved on PC-files. Subphase number, circled in the picture above, is automatically updated when the editor is started and the code first displayed.

Name and number of the selected phase is shown on the same row as the headline.

The phase editor works in two modes, COMMAND mode and INSERT mode. **F2** is used to toggle between the two modes. **F2**-key

text indicates the active status.

COMMAND MODE
This mode is always activated when editor is started. The following functions are available on function keys.

KEY	KEY TEXT	FUNCTION
F1	PREV	Abort editor and skip changes
F2	CMDMODE	Toggle to INSERT MODE
F3	SYSDEF	Immediate access to SYSTEM DEFINITION MENU
F4	INSROW	Insert a blank row at cursor position
F5	DELROW	Delete row at cursor position
F6	SEARCH	String-search from current cursor position and forward
F7	MARK	Mark/unmark current row. Marked row is indicated with '*' after the row number
F8	COPY	Copies marked row to cursor position
F9	HELP	Help text
F10	EXIT	Exit editor and save changes

The computer counts the number of parameters used in the phase when the operator exits the menu with **F10**. A phase is only allowed to contain 50 parameters and an error message is shown in line 25 if this limit is exceeded.

INSERT MODE
The actual phase code is changed in INSERT MODE.The function keys have different functions in this mode depending on the active field.

OPERATOR FIELD 1
Operator field 1 is filled by pressing a function key. The following functions are available:

KEY	KEY TEXT	FUNCTION
F2	INSMODE	Toggle to COMMAND MODE
F3	SET	Insert 'SET' in operator field 1
F4	IF	Insert 'IF' in operator field 1
F5	AND	Insert 'AND' in operator field 1
F6	OR	Insert 'OR' in operator field 1

KEY	KEY TEXT	FUNCTION
F7	)	Insert ')' in operator field 1
F8	JMP	Insert 'JMP' in operator field 1
F9	END	Insert 'END' (end subphase) in operator field 1
F10	EPH	Insert 'EPH' (end phase) in operator field 1

OPERATOR FIELD 2
Operator field 2 is filled by pressing a function key. The following functions are available.

KEY	KEY TEXT	FUNCTION
F2	INSMODE	Toggle to COMMAND MODE
F7	(	Insert '(' in operator field 2
F8	NOT	Insert 'NOT' in operator field 2
F9	SLP	Insert 'SLP' in operator field 2
F10	BLANK	Blank operator field 2

OPERAND FIELD
The OPERAND field can be filled in two ways.

A Select operand-type with the function keys (DO, DI..).

Enter the operand-index in the dialog box shown in the window. The symbolic name is copied to the current field if the operand is defined.

B Select operand-type with the function keys (DO, DI ..).

Press **F3** for a list of defined operands.

Highlight one of the items and press **ENTER**. The symbolic name is copied to current field.

Following function keys are available.

KEY	KEY TEXT	FUNCTION
F1	MORE	Show next set of operand-types. Different sets are available on **F4 - F10**.
F2	INSMODE	Toggle to COMMAND mode
F3	LIST	Show list of defined operands

KEY	SET No.1	SET No. 2	SET No. 3	SET No. 4
F4	DO	CR	F0.S	AC.S
F5	DI	TI.S	F0.H	AC.O
F6	BU	TI.H	LI	
F7	LE	TI.O	AV	
F8	IT	CT.S	SV	
F9	ET	CT.C	SF	
F10	BT	CT.O	UF	PH

All operands except phases (PH) must be defined with a symbolic name before they can be inserted.

Available phases are either phases stored in the PACS 2000 phase directory or phases stored in active the PC-path directory. The active directory depends on how the editor was activated.

WAY OF SELECTION	ACTIVE PHASE DIRECTORY
Edit PACS phase	PACS phase directory
Edit PC phase	PC-path directory
Create new phase in ON-LINE MODE	PACS phase directory
Create new phase in LOCAL MODE	PC-path directory

COMMENT FIELD
Comment field is a 16 character long alphanumeric string. Comments are not stored in PACS, only in PC-files.

SAVE PHASE IN PACS

This menu saves the selected phase in PACS. Name and number of the selected phase is shown on same row as the headline.

PHASE NO is a numeric field and accepts only input of the digits 0 - 9. The field is initialized with the number of the selected phase and is not allowed to be left blank.

PHASE NAME is a alphanumerical field that is16 characters long.The field is initialized with the name of the selected phase and is not allowed to be left blank.

Save is activated with **F10**.
If the phase number already exists in the PACS 2000 that phase will be overwritten without warning.

Function keys:
F1 PREV - Abort storage

F9 HELP - Help text

F10 EXIT - Activate storage

SAVE PHASE ON PC

This menu saves the selected phase on a disk file. The file is stored under a name with the format PHxxxx.PHS where xxxx is the phase number. Name and number of the selected phase is shown on same row as the headline.

PHASE NO is a numeric field and accepts only input of the digits 0 - 9. The field is initialized with the number of the selected phase and is not allowed to be left blank.

PHASE NAME is a alphanumerical field that is16 characters long.The field is initialized with the name of the selected phase and is not allowed to be left blank.

PATH is a 60 character long field that specifies the directory where the file should by stored. The PATH field is initialized with the same string as STORE PC PATH in menu PC PATH DEFINITION (See Page 86). If PATH is altered in this menu it doesn't affect any field in PC PATH DEFINITION menu.

Save is activated with **F10**. If the file name already exists on disk a message is shown on the screen. The operator can choose to overwrite the existent file or to change the file name i.e. phase number.

Function keys:
F1 PREV - Abort storage

F9 HELP - Help text

F10 EXIT - Activate storage

LOAD PC PHASES TO PACS

In this menu the operator can select a number of phases stored on disk and have them transferred to PACS.

A list of found phases is shown i a scrollable window. A file is high-lighted with ⇧⇩ and selected with **F7**. Selected files are marked with * and sent to PACS when pressing **F10**.

Function keys:
F1 PREV - Abort changes and leave menu

F5 ALLMARK - Mark all phases

F6 UNMARK - Remove marking on all phases

F7 MARK - Mark actual phase

F9 HELP - Help text

F10 EXIT - Activate loading of selected phases and leave menu

DELETE PACS PHASE

This menu makes it possible to delete phases stored in PACS.

PACS 2000 phase directory is shown in a scrollable list. A phase is highlighted with ⇧⇩ and deleted with **F8**.

Make sure that the highlighted phase is the one you want to delete. There is no ”undo” when you have pressed **F8**.

Function keys:
F1 PREV - Previous menu

F8 DELETE - Delete highlighted phase

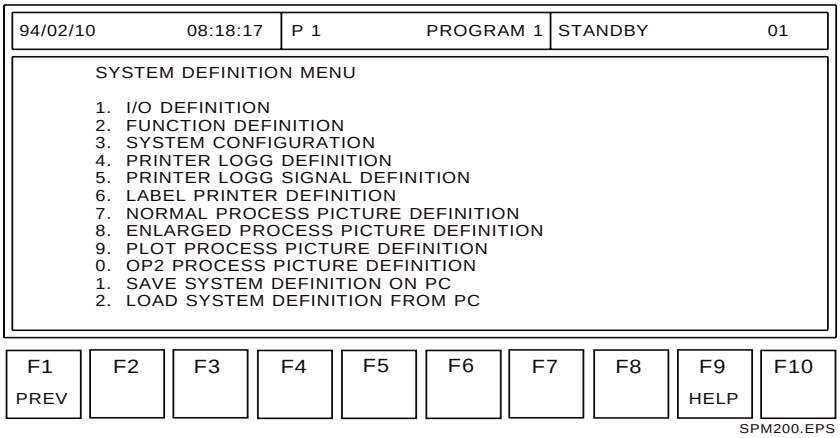
F9 HELP - Help text

FIND UNUSED PACS PHASES

When activating this menu item the system is scanned for phases not used by the system. Found phases are displayed in a scrollable list. Listed phases can be deleted with **F8**.

The message ”All PACS phases used.” will be displayed should all phases be used.

SYSTEM DEFINITION MENU



SPM200.EPS

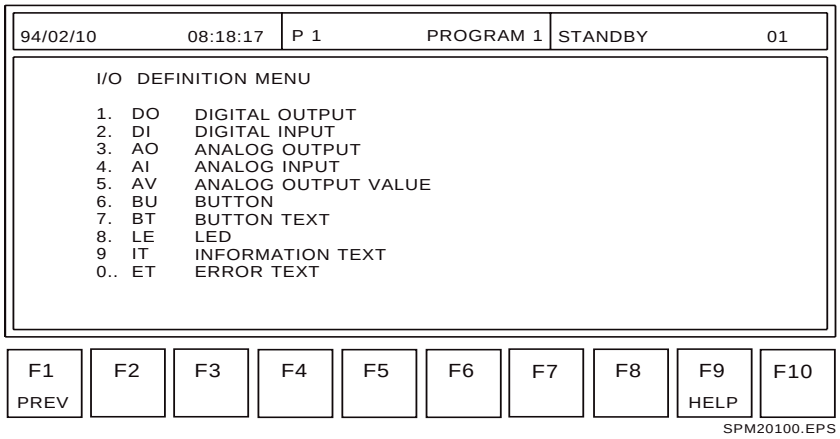
System definition menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

I/O DEFINITION MENU



SPM20100.EPS

I/O definition menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

DIGITAL OUTPUT DEFINITION

This menu defines the symbolic names for digital outputs.

The number of digital outputs shown in the scrollable window depends on the number of DO-modules specified in the SYSTEM CONFIGURATION MENU (See Page 69). Maximum 64 channels can

be specified i.e. 8 channels per module and maximum 8 modules per system.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

DIGITAL INPUT DEFINITION

This menu defines the symbolic names for digital inputs.

The number of digital inputs shown in the scrollable window depends on the number of DI-modules specified in the SYSTEM CONFIGURATION MENU (See Page 69). Each module contains 8 channels. Maximum 64 channels can be specified i.e. 8 channels per module and maximum 8 modules per system.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ANALOG OUTPUT DEFINITION

This menu defines the symbolic names for Analog outputs.

The number of analog outputs shown in the scrollable window depends on the number of AO-modules specified in the SYSTEM CONFIGURATION MENU (See Page 69). Each module contains 2 channels. Maximum 8 channels can be specified i.e. 2 channels per module and maximum 4 modules per system.

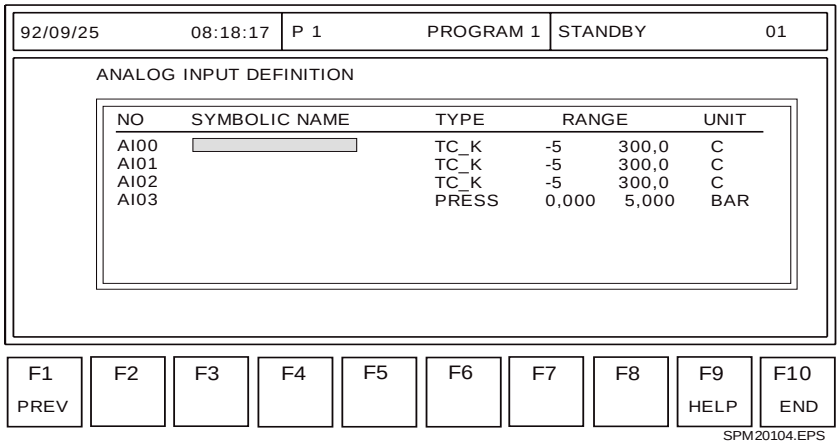
A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ANALOG INPUT DEFINITION



Analog input definition menu

This menu defines only the symbolic names for analog inputs with exception for module type 11 (See page71). Range and unit for such modules can be set in this menu. The selected range is automatically scaled within the output limits selected for the sensor type.

The number of analog inputs shown in the scrollable window depends on the AI-modules specified in the SYSTEM CONFIGURATION MENU (See Page 69). Max 32 AI-channels on 10 AI-modules can be specified.

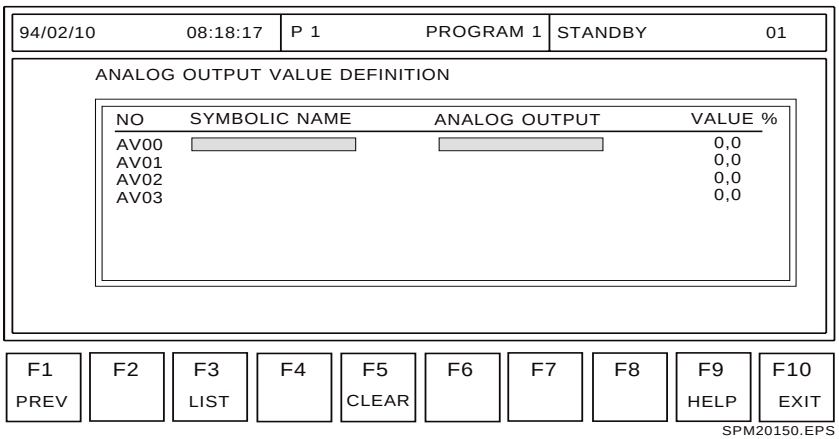
A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ANALOG OUTPUT VALUE DEFINITION



Analog output value definition menu

This menu defines symbolic names, connected outputs and values for AV-functions.
Eight AV-functions can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F3 LIST - Show choice list

F5 CLEAR - Clears active field

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT.
The analog output is set to preset value when the AV-function is activated.

BUTTON DEFINITION

This menu defines the symbolic names for all possible operator panel buttons in a PACS-system. The push buttons on the operator panels can be defined and used in the Boolean program.

The table below shows the number of operator panels that can be connected to the PACS 2000 and the number of buttons on each operator panel.

OPERATOR PANEL	CONNECTED PANELS	BUTTONS PER PANEL
OP 1	2	2
OP 2	2	10
OP 3	3	15

The button name is built up as follows. BUxyzz

x: Operator panel type 1,2 or 3

y: Sequence number of the operator panel type (see table below).

PANEL DENOMINATION	SEQUENCE No.
OP11	0
OP12	1
OP21	0
OP22	1

PANEL DENOMINATION	SEQUENCE No.
OP31	0
OP32	1
OP33	2

zz: Button number in the operator panel

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

BUTTON TEXT DEFINITION

This menu defines text strings for five of the function keys on OP 3, OP C and OP H used in the process pictures. Eight different texts can be defined for each function key. The text strings are limited to 7 characters each.

The physical button text name is in this menu displayed as: BTxy

x: Function key number 0 - 4 (**F6** - **F10**)

y: Alternative text strings 0 - 7

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT ..
The button text is a five character button definition text for function keys F6-F10 appearing in operator mode in OP 3, OP C, OP H.

Up to eight texts can be defined for each function key defined in the PACS 2000 as shown in the table below.
Note that only BT plus the last two digits are displayed in this menu while the whole denomination, as shown in the table, is displayed in the programming menus.

F6	F7	F8	F9	F10
BT 3X00	BT 3X10	BT 3X20	BT 3X30	BT 3X40
BT 3X01	BT 3X11	BT 3X21	BT 3X31	BT 3X41

F6	F7	F8	F9	F10
BT 3X02	BT 3X12	BT 3X22	BT 3X32	BT 3X42
BT 3X03	BT 3X13	BT 3X23	BT 3X33	BT 3X43
BT 3X04	BT 3X14	BT 3X24	BT 3X34	BT 3X44
BT 3X05	BT 3X15	BT 3X25	BT 3X35	BT 3X45
BT 3X06	BT 3X16	BT 3X26	BT 3X36	BT 3X46
BT 3X07	BT 3X17	BT 3X27	BT 3X37	BT 3X47

X=0 for 1:st OP 3 / OP C, X=1 for 2:nd OP 3 / OP C and X=2 for OP H.

If more then one button text is activated for the same function key the last text set by the PACS 2000 program will be displayed. When this text is deleted any other active text for that function key is displayed searched from 0 to 7.

LED DEFINITION

This menu defines the symbolic names for LED's on all possible operator panels in a PACS-system.

The table below describes how many operator panels that can be connected to the PACS 2000and how many LED's each operator panel can have.

OPERATOR PANEL	CONNECTED PANELS	NUMBER OF LED's PER PANEL
OP 1	2	7
OP 2	2	16
OP 3	3	16

The physical LED name is built as follows. LExyzz

x: Operator panel type 1,2 or 3

y: Sequence number of the operator panel type.

PANEL DENOMINATION	SEQUENCE No.
OP11	0
OP12	1
OP21	0

PANEL DENOMINATION	SEQUENCE No.
OP22	1
OP31	0
OP32	1
OP33	2

zz: LED number in the operator panel.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

INFORMATION TEXT DEFINITION

This menu defines the symbolic names for information texts. The symbolic name and the actual text is equivalent.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT ..
The information text is a 16 character long operator information message appearing on OP 2, OP 3, OP C and OP H. Up to 32 information texts can be defined as IT00-IT31.

If more than one information text is activated the last text set by the PACS 2000 program will be displayed. When this text is deleted any other active text is displayed searched from 00 to 31.

ERROR TEXT DEFINITION

This menu defines symbolic names for Error texts. The symbolic name and the actual text is equivalent.

32 Error Texts can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

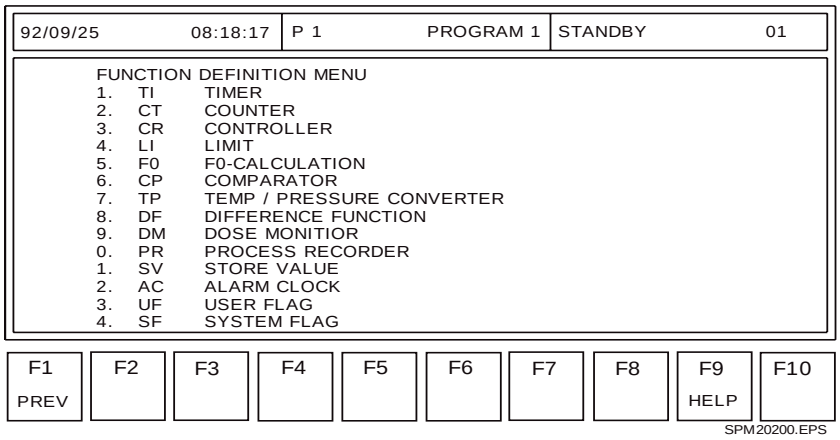
F10 EXIT - Exit menu and save changes.

ABOUT ..
The error text is a 16 character long message appearing in OP 2, OP 3, OP C and OP H and in the ERROR LOGG. The ERROR TEXT is printed in red if a colour printer is connected to the system.

If more than one error text is activated only the last text set by the PACS 2000 program will be displayed. When this text is deleted any other active text is displayed searched from 00 to 31.

All activated error texts are printed although only the one that occurred last is displayed.

FUNCTION DEFINITION MENU



Function definition menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

ABOUT..
The function definition is performed to register all functions needed to execute a specific control application in the PACS 2000.
Generally a function includes a SET VALUE, an INPUT and an OUTPUT. The definition is made by declaring a symbolic name of max 16 characters for each SET VALUE, INPUT and OUTPUT. For some functions even preprogrammable parameters has to be set. Only the defined functions exists in PACS 2000 and will pop-up in the menus used when programming and defining process pictures.

The SET VALUES of some functions (timers, counters, controllers and limiters) are treated as parameters to programs (see chapter PROGRAMMING).

SET VALUE and INPUT VALUE can not only be a numeric value but also the output of another value. Up to four functions may be cascaded in this way.

The I/O definition is done with an OP 3 or OP C.

TIMER DEFINITION

This menu defines the symbolic names for timers. Up to 64 timers can be defined.
A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT..
Function
PACS 2000 includes 64 timers for time measuring between 1 second and 99 hours, 59 minutes and 59 seconds.

There are three digital signals used by the timer; START/RESET, HOLD and OUT and these signals can all be used in the boolean program. The SET TIME is a parameter to the program.

The time measuring begins when ”start” is activated. When the defined set time have elapsed ”out” is activated and the timer is stopped. When ”start” is deactivated ”out” and elapsed time is cleared. The time

Special timers
There are two special timers in the PACS 2000:

- TI64with preset symbolic name ”PROGRAM TIMER”
- TI65 with preset symbolic name ”PHASE TIMER”.

TI64 can be used by the PACS 2000 program to measure the time of a complete process.

TI65 is controlled by the system program and can not be controlled by the PACS 2000 program. TI65 is restarted at each phase shift measuring the time of each sterilizer phase.

Both TI64 and TI65 may be displayed in the process pictures.

COUNTER DEFINITION

This menu defines the symbolic names for counters.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT..
Function
The PACS 2000 includes 8 counters for counting up to 65.535 pulses.

There are three digital signals used by the counter; START/RESET, COUNT and OUT. These signals can be used in the Boolean program. The SET VALUE is a parameter to the program.

The counter is started if ”start” is activated and a positive slope is detected on ”count”. ”Out” is activated if the elapsed value equals the defined set value. When ”start” is deactivated ”Out” and elapsed value is cleared.

Special counters
There are two special counters in the PACS 2000:

- CT08 with preset symbolic name ”MACHINE COUNTER”
- CT09 with preset symbolic name ”MACHINE TIMER”

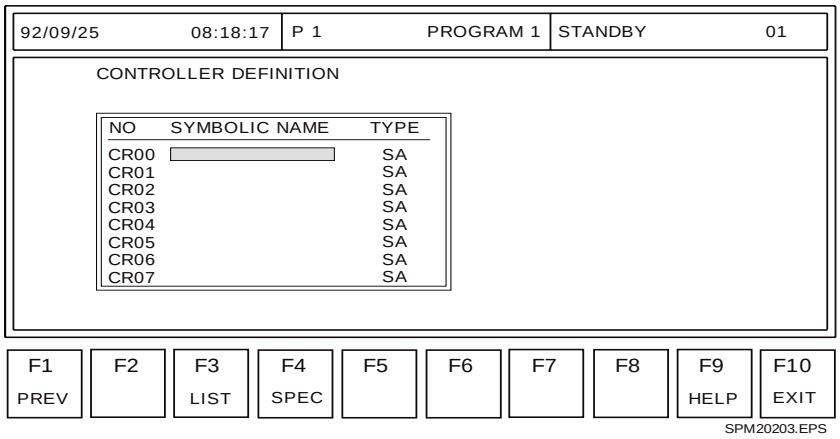
Both counters are controlled by the system program and can not be controlled by the PACS 2000 program.

CT08 is an incremental sterilizer program counter. The counter is incremented each time the system flag ”SF21, CYCLE EXECUTED” is set by the PACS 2000 after each completed process.

CT09 is the PACS 2000 lifetime indicator. The counter value is the accumulated program time of the PACS 2000 in hours.

Both CT08 and CT09 may be displayed in the process pictures.

CONTROLLER DEFINITION



Controller definition menu

This menu defines type and symbolic name for controllers. Up to 32 Controllers can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

The TYPE-field is filled via a choice list with the following alternative

SA	Sterilization Analog
SD	Sterilization Digital
FA	Fermentation Analog
FD	Fermentation Digital

The choice list is activated with **F3** and the field is protected against any other type of input.

Each type of controller is specified in pop up windows activated by **F4**. These windows are described under separate headlines below. **F4**

can only be activated if a symbolic name has been entered.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F4 SPEC - Specify controller type

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ABOUT.
Function
A controller is activated/deactivated by the Boolean program.

Set value
The set value could be fixed or a ramp. The set value as well as the ramp are parameters to the program.
The actual value is considered to be the start value when a controller is started with a ramp. The set value will then increase or decrease with the programmed ramp slope.

Set value offset
(only available on fermentation controllers type FA and FD.)
The programming of Set value offset tells which controller to connect for cascading two or more controllers.

The first controller in the cascade, the master, will calculate an analog signed copy of its output value, -100% to +100%, and output this as a set value offset.
The connected controller, the slave, will add the set value offset to its own set value according to the formula
set value = set value offset * 2 * P-band + set value

If a second slave controller is connected to the first, creating a three controller cascade, the first slave will output ”the rest” from the master controller that what is not used in the first slave, as a set value offset to the second slave controller.
The rest is all set value offsets above 50% since 50% * 2 * P-band is 100% of P-band.
For instance, if the set value offset from the master is +75%, +25% will be the set value offset to the second slave controller:

Master	P-band = 5.0 ^{o}C
	set value = 100.0 ^{o}C
	set value offset = 75.0%
Slave 1	P-band = 5.0 ^{o}C
	set value = 75.0% * 2 * 5.0 ^{o}C + 100.0 ^{o}C = = 105.0 ^{o}C + rest 25.0%
	set value offset = 25.0%

Slave 2	P-band = 5.0 ^{o}C
	set value = 25.0% * 2 * 5.0 ^{o}C + 100.0 ^{o}C = 102.5 ^{o}C
	set value offset = 0%

Analog control value
The analog control value is programmed as an analog output and is identical to the controllers output 0-100%.
It is used to control for example valves.

Increase/decrease Digital control status
The digital control status is programmed as a digital output and is proportional to the controllers output value.
For example, with a 50% output value the digital signal is ”on” for 50% of TP and ”off” for 50% of TP.

The increase digital control status and the decrease digital control status is used in the same way as the direct/reverse function for analog control value:
The increase digital control output is proportional 0-100% for positive deviations and proportional 0% for negative deviations.
The decrease digital control output is proportional 0-100% for negative deviations and proportional 0% for positive deviations.

PID function
The controller includes functions for **P**roportional, **I**ntegrating and **D**erivative additions to the controller output called the p-part, the i-part and the d-part.

The controller is a digital sampled controller with sample time 0.25 seconds. For every sample the inputs are read and a new output calculated.
The parameters for controlling the p-, i- and d-part is the P-band, the I-time and the D-time.

P-band
The p-band is the factor that controls the p-part of the controller. It is defined as the band above and below the set value within witch the controller output is proportional to the deviation between set value and actual value.

For instance, if the p-band is 5.0 ^{o}C then the p-band exists within set value + 5.0 ^{o}C and set value - 5.0 ^{o}C. If the deviation is 2.5 ^{o}C the controller output is 50%.

$$\text{p-part} = \frac{\text{set value - actual value}}{\text{p-band}}$$

The output is 100% outside the p-band, i.e. for deviations greater than 5.0 ^{o}C.

I-time
The I-time is the integration time and is defined as the time to accumulate an addition to the output as big as the p-part.

$$\text{i-part}_{new} = \text{p-part} \times \frac{\text{sample time}}{\text{i-time}} + \text{i-part}_{old}$$

The range of the I-time is 0.00 - 99.99 minutes.

D-time
The d-time is the derivation time and gives an addition to the output at changes in the deviation.

$$\text{d-part} = \text{p-part} \times \frac{\text{d-time}}{\text{sample time}} \times (dev_{(n)} - dev_{(n-1)})$$

$dev_{(n)}$ is the deviation at the active sample and $dev_{(n-1)}$ is the deviation at the previous sample.

The range of the D-time is 0.00 - 99.99 minutes.

TP value
TP is the period time for the digital control outputs. For instance, if the controller output is 50% and TP is 5 seconds the digital control output will be set for 2.5 seconds and reset for 2.5 seconds.

The range of the TP value is 0 - 59 seconds.

TL value
TL is the output activation delay time for the digital control values. If a TL is entered the controller will run one sample, keep the outputs for one TL time and then run one sample again and so on.

The range of the TL value is 0 - 59 seconds.

Dead band
The dead band is defined as the band above and below the set value within witch the controller output is kept constant.

Reverse
The reverse switch is used for analog controllers and tells the controller to activate upon increasing or decreasing actual values.

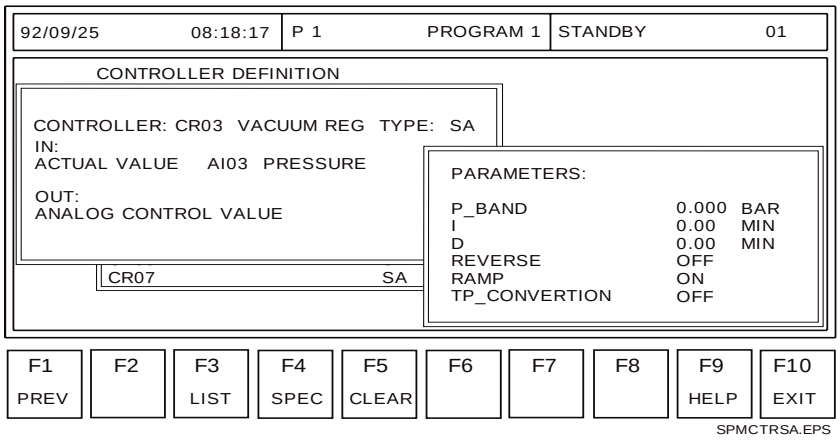
The direct function is default. With direct function the controller output is 0-100% for positive deviations and 0% for negative deviations.

With reverse function the controller output is 0-100% for negative deviations and 0% for positive deviations.

For example direct function is used to control a temperature with a heater and the reverse function to control a temperature with a cooler.

Temperature/pressure conversion
A temperature as set value can be converted to a pressure according to the water and steam saturation table.

Controller type SA



Controller type SA

A Sterilization Analog (SA) controller is specified in two pop up windows placed upon the first controller menu.

The first window specifies what is connected to the input and output of the controller. IN-field is filled via a two steps choice list where the operator can choose between defined AI-, TP-, CP- and DF- functions. ACTUAL VALUE must be filled.

OUT-field is filled via a choice list containing defined AO-signals. OUT-field must not be filled to leave the window.

Function keys:
F1 PREV - Abort window and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit window and save changes

After the first pop up window is filled the controller parameter window is automatically displayed.

Field specifications:

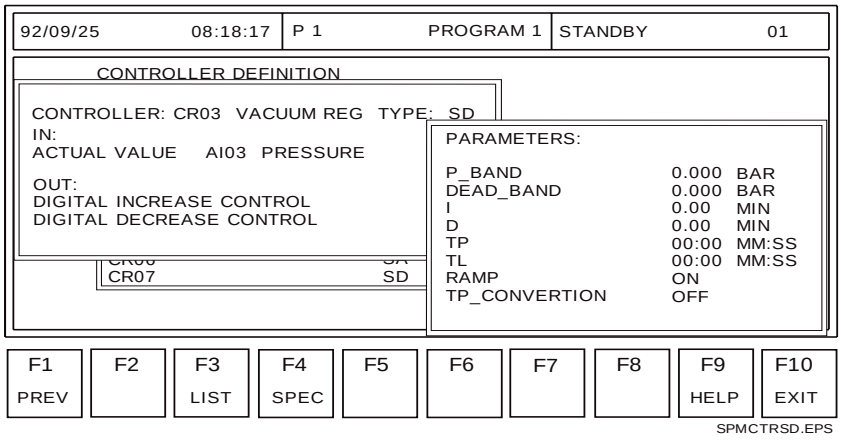
P_BAND	Unit, format and range limits according to ACTUAL VALUE sensor type.
I	Range 0.0 - 99.9 Minutes
D	Range 0.0 - 99.9 Minutes
REVERSE	Alternatives ON/OFF
RAMP	Alternatives ON/OFF
TP_CONV	Alternatives ON/OFF

Function keys:
F1 PREV - Abort window and skip all changes

F9 HELP - Help text

F10 EXIT - Exit window and save changes

Controller type SD



Controller type SD

A Sterilization Digital (SD) controller is specified in two pop up windows placed upon the first controller menu.

The first pop up window specifies what is connected to the input and output of the controller. IN-fields are filled via a two steps choice list where the operator can choose between defined AI-,TP-, CP- and DF-functions. ACTUAL VALUE must be filled.

OUT-fields are filled via a choice list containing defined DO-signals. OUT-fields must not be filled to leave the window.

Function keys:
F1 PREV - Abort window and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT -Exit window and save changes.

After the first pop up window is filled the controller parameter window is automatically displayed.

Field specifications:

P_BAND	Unit, format and range limits according to ACTUAL VALUE sensor type.
DEAD_BAND	Unit, format and range limits according to ACTUAL VALUE sensor type.

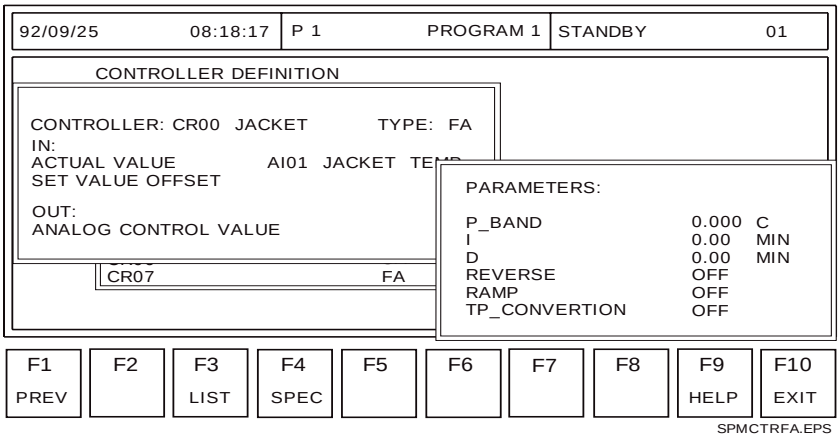
I	Range 0.0 - 99.9 Minutes
D	Range 0.0 - 99.9 Minutes
TP	Range 00:00 - 00:59 min.: sec.
TL	Range 00:00 - 59:59 min.: sec.
RAMP	Alternatives ON/OFF
TP_CONV	Alternatives ON/OFF

Function keys:
F1 PREV - Abort window and skip all changes

F9 HELP - Help text

F10 EXIT - Exit window and save changes

Controller type FA



Controller type FA

A Fermentation Analog (FA) controller is specified in two pop up windows placed upon the first controller menu.

The first window specifies what is connected to the input and output of the controller.

The ACTUAL VALUE field is filled via a two steps choice list where the operator can choose between defined AI-, TP-, CP- and DF- functions. ACTUAL VALUE must be filled.
SET VALUE OFFSET is filled via a choice list containing defined controllers of type FA and FD. No entry is required in this field.

OUT-field is filled via a choice list containing defined AO-signals. OUT-field must be filled to leave the window.

Function keys:
F1 PREV - Abort window and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit window and save changes

After the first pop up window is filled the controller parameter window is automatically displayed.

Field specifications:

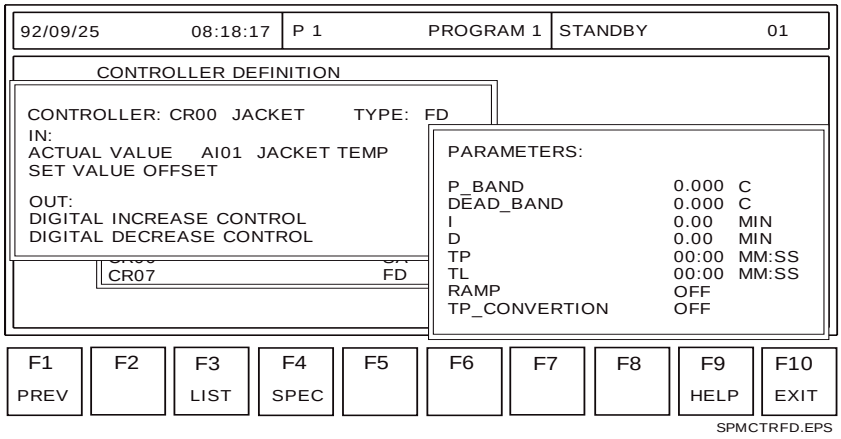
P_BAND	Unit, format and range limits according to ACTUAL VALUE 1 sensor type.
I	Range 0.0 - 99.9 Minutes
D	Range 0.0 - 99.9 Minutes
REVERSE	Alternatives ON/OFF
RAMP	Alternatives ON/OFF
TP_CONV	Alternatives ON/OFF

Function keys:
F1 PREV - Abort window and skip all changes

F9 HELP - Help text

F10 EXIT - Exit window and save changes

Controller type FD



Controller type FD

A Fermentation Digital (FD) controller is specified in two pop up windows placed upon the first controller menu.

The first pop up window specifies what is connected to the input and output of the controller.

The ACTUAL VALUE field is filled via a two steps choice list where the operator can choose between defined AI-, TP-, CP- and DF- functions. ACTUAL VALUE must be filled.
SET VALUE OFFSET is filled via a choice list containing defined controllers of type FA and FD. No entry is required in this field.

OUT-fields are filled via a choice list containing defined DO-signals. Both OUT-fields must be filled to leave the window.

Function keys:
F1 PREV - Abort window and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit window and save changes

After the first pop up window is filled the controller parameter window is automatically displayed.

Field specifications:

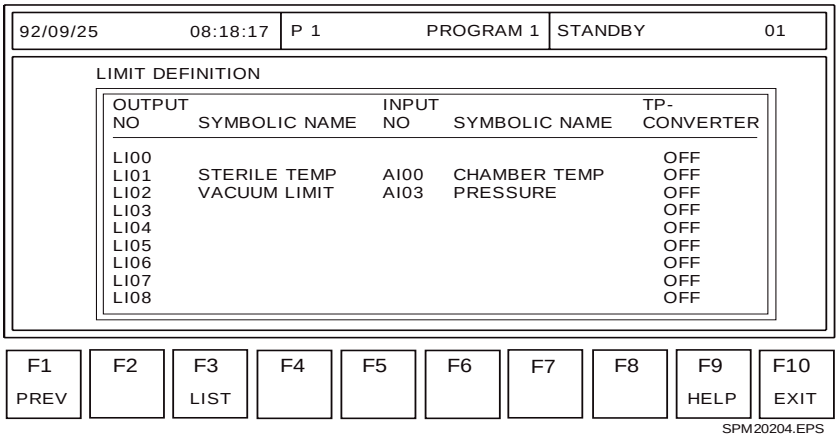
P_BAND	Unit, format and range limits according to ACTUAL VALUE 1 sensor type.
DEAD_BAND	Unit, format and range limits according to ACTUAL VALUE 1 sensor type.
I	Range 0.0 - 99.9 Minutes
D	Range 0.0 - 99.9 Minutes
TP	Range 00:00 - 00:59 min.: sec.
TL	Range 00:00 - 59:59 min.: sec.
RAMP	Alternatives ON/OFF
TP_CONV	Alternatives ON/OFF

Function keys:
F1 PREV - Abort window and skip all changes

F9 HELP - Help text

F10 EXIT - Exit window and save changes

LIMIT DEFINITION



SPM20204.EPS

Limit definition menu

This menu defines the symbolic names, connected inputs and internal TP-conversion for LIMIT functions. 64 limits can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

INPUT fields are filled via a two steps choice list where the operator can choose between defined AI, AO, F0, CP, TP, DF, DM and SV functions.

TP-conversion field turns internal TP-conversion on and off. The operator can toggle between the alternatives ON/OFF with **SPACE** when in these fields.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

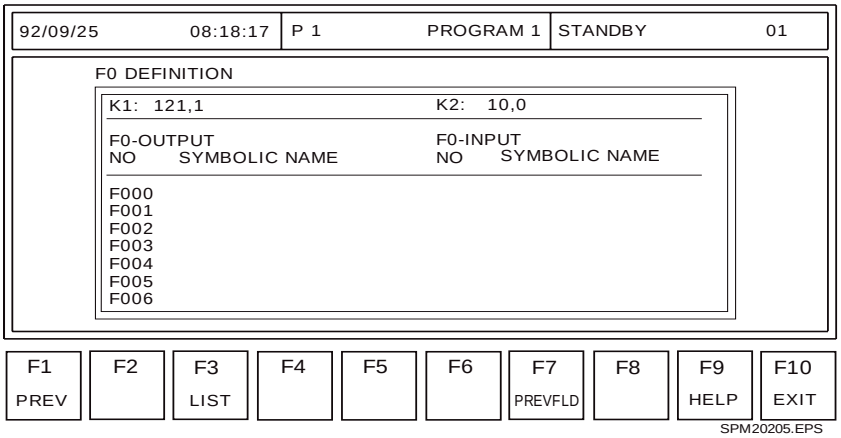
F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ABOUT..
Function
The limit set value is a parameter to the program. The limit is used as a digital signal to the Boolean program.

When the analog input value is lower than or equal to the limit set value the limiter is inactive. When the analog input value is higher than the limit set value the limiter is active.
If the set value is a temperature it can be converted to a pressure according to the water and steam saturation table.

F0 DEFINITION



F0 definition menu

This menu defines the symbolic names, connected inputs and K-factors for F0-calculation.

K1 is a value between 0.0 - 150.0

K2 is a value between 0.0 - 99.9

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

F0-INPUT fields are filled via a choice list where the operator can choose between defined AI and CP with connected temperature sensors.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F7 PREVFLD - Previous field moves the cursor from the scrollable area to K2-field.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ABOUT..
Function
F0-calculation for up to 24 temperature inputs exists. Calculation is done according to the integrating formula:

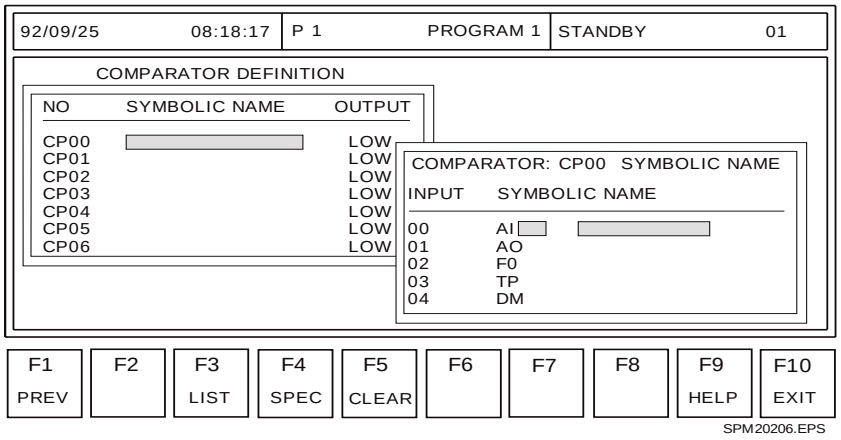
$$F_0 = \int_0^t 10^{\frac{(T(t)-k_1)}{k_2}} \times dt$$

where

- Tau is the load temperature at t
- k_1 typical 121.1 ^oC
- k_2 typical 10.0 ^oC

There are two digital signals used by the F0 calculator; START/STOP and HOLD. These signals can be used in the boolean program. The calculation starts when start/stop is activated and when deactivated the calculation stops and the F0 values are cleared.
The calculation can temporarily be halted by activating hold.
The F0 value is calculated once per second. A broken sensor ”goes high” e.g. gives the value 9999 and is excluded from the calculation.

COMPARATOR DEFINITION



Comparator definition menu

This menu defines the symbolic names and output types for comparators. Eight comparators can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

The OUTPUT-field defines if the highest, mean or lowest input level should be used as output. The operator can chose between HIGH/ MEAN/LOW in a list activated with **F3** when in an OUTPUT-field.

Each comparator can have 16 input signals connected to it. The connection is done in a pop up window activated by **F4**.

F4 can only be activated if a symbolic name is entered.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F4 SPEC - Specify comparator input

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

Comparator input specification
Input NAME-fields are filled via a two steps choice list where the operator can choose between defined AI, AO, F0, TP and SV functions. The unit of a comparator is determined by the sensor connected to input 00.

Function keys:
F1 PREV - Abort window and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit window and save changes

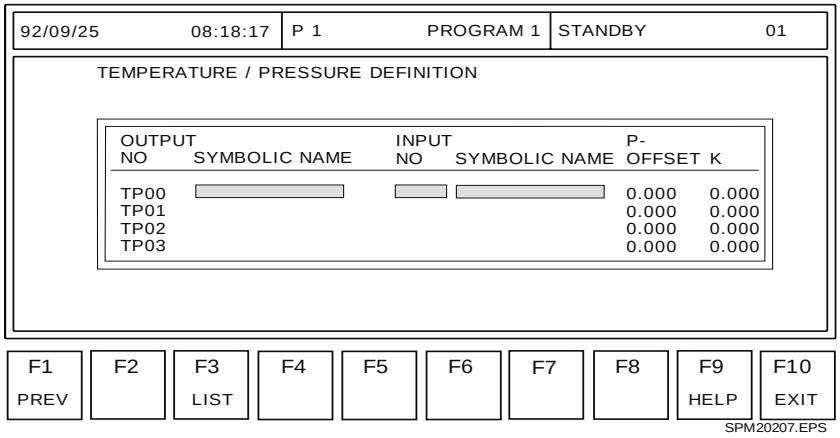
ABOUT..
Function
The comparator checks the input signals and if the function switch ”high” is set the highest input value is copied to the comparator output.

If the function switch ”mean” is set the mean input value is copied to the comparator output.

If the function switch ”low” is set the lowest input value is copied to the comparator output.

A broken sensor ”goes high” e.g. gives the value 9999 and is excluded from the calculation.

TEMP. / PRESS. CONVERTER



Temp. / press. converter menu

This menu defines the symbolic names, connected inputs and constants for TP-converters. 4 TP-converters can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

INPUT fields are filled via a two step choice list where the operator can choose between defined AI, SV and CP functions with temperature sensors.

P-offset is a value between 0.000 - 5.000 bar

K is a value between 0.000 - 9.999

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

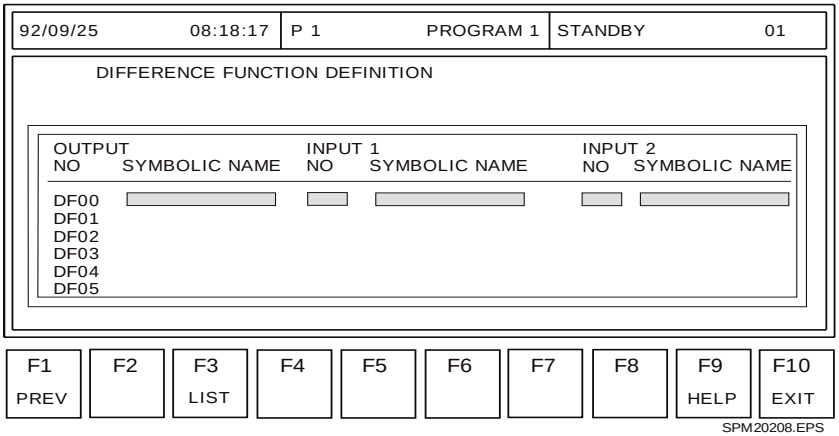
ABOUT..
The pressure is derived according to:

$$p = k \times T + p_{offset} + p_{steam}$$

where:

- k is a parameter within the range (0 - 9.999)x10^{-3}
- T is the temperature input converted to degrees Kelvin
- p_{offset} is a parameter within the range 0 - 5.000 bar
- p_{steam} is the steam pressure at T ^{o}K according to the water and steam saturation table

DIFFERENCE FUNCTION DEFINITION



Difference function definition menu

This menu defines symbolic name and connected inputs for the DIFFERENCE FUNCTION.
Eight difference functions can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

INPUT fields are filled via a two step choice list where the operator can choose between defined AI, AO, F0, CP, TP and SV functions.

Output value is calculated as INPUT 1 - INPUT 2. Note that INPUT 1 and INPUT 2 must be of the same type.

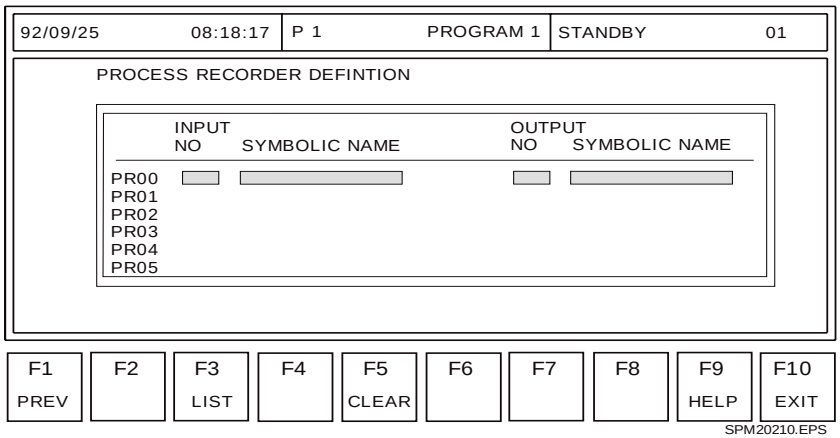
Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

PROCESS RECORDER DEFINITION



Process recorder definition menu

This menu defines connected inputs and outputs for the PROCESS RECORDER function. Six process records can be defined.

INPUT fields are filled via a two step choice list where the operator can choose between defined AI, F0, TP and functions.

OUTPUT fields are filled via a choice list where the operator can choose between defined AO signals.

Function keys:
F1 PREV - Abort menu and skip all changes

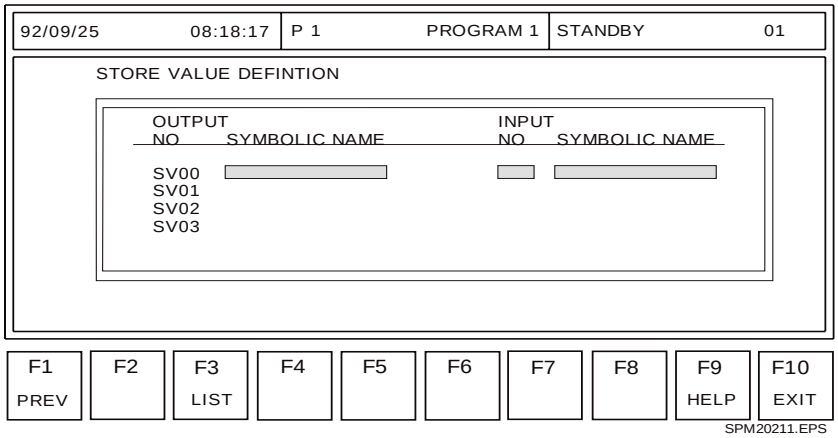
F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

STORE VALUES DEFINITION



Store value definition menu

This menu defines symbolic names and connected inputs for STORE VALUE functions. Four store value functions can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

OUTPUT fields are filled via a two step choice list where the operator can choose between defined AI, AO, F0, CP, TP and DF functions.

Function keys:
F1 PREV - Abort menu and skip all changes

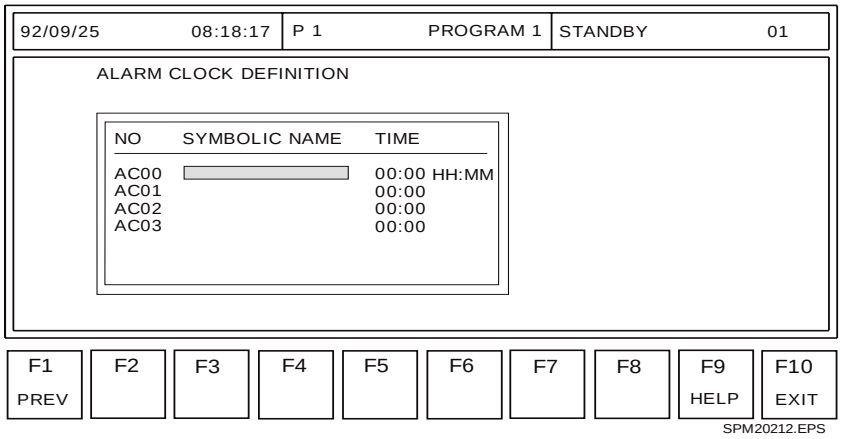
F3 LIST - Show choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ABOUT..
Function
The store value function is an analog memory for up to 4 analog values. The value of the input is latched and stored when the function is active.

ALARM CLOCK DEFINITION



Alarm clock definition menu

This menu defines symbolic names and time values for ALARM

CLOCK functions. Four ALARM CLOCK functions can be defined.

A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.
TIME field should be within the range 00:00 - 23:59 min.: sec.

Function keys:
F1 PREV - Abort menu and skip all changes

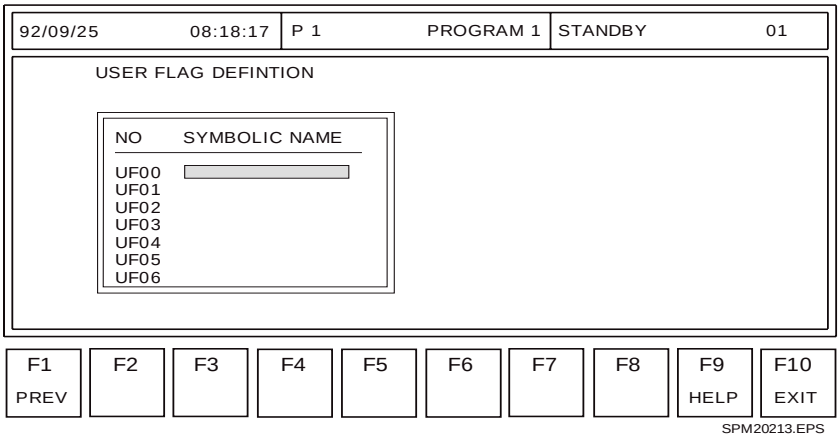
F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ABOUT..
Function
Four alarm clock functions exists for setting an alarm time point between 00:00 and 23:59.

There are two digital signals used by the alarm clock; START/STOP and OUT. These signals can be used in the boolean program.
If the alarm clock ”start” is activated the real time clock is checked and when it equals the alarm time the ”out” is activated during one minute. OUT is also deactivated by deactivating START.

USER FLAG DEFINITION



User flag definition menu

This menu defines symbolic names for USER FLAGS.

128 USER FLAGS can be defined and used as help flags or memory flags in the Boolean program.

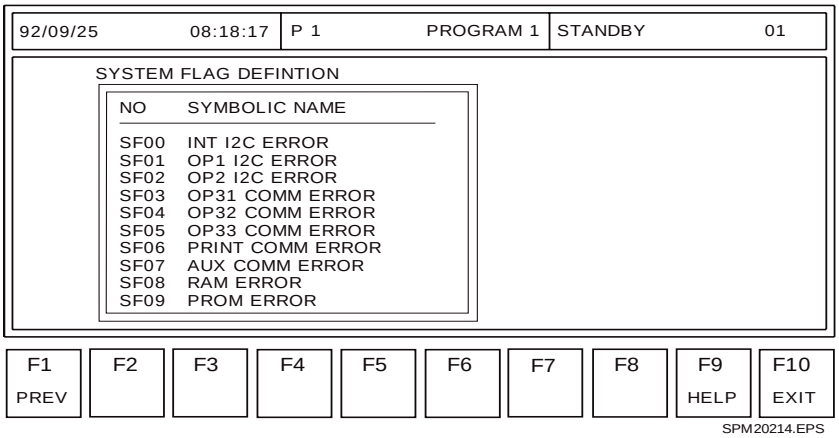
A symbolic name is not allowed to begin with '+', '-', '.' or 0-9.

Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

SYSTEM FLAG DEFINITION



SPM20214.EPS

System flag definition menu

This menu shows the symbolic names for SYSTEM FLAGS. SYSTEM FLAGS have preset names and can not be changed by the operator.

Function keys:
F1 PREV - Exit menu

F9 HELP -Help text

F10 EXIT - Exit menu

The following SYSTEM FLAGS are defined in the system:

FLAG	SYMBOLIC NAME	EXPLANATION
SF00	INT I2C ERROR	I/O 12C ERROR This is an overall I/O error flag indicating communication error with digital input modules, digital output modules, analog input modules and analog output modules.
SF01	OP 1 I2C ERROR	OP1 I2C bus communication error
SF02	OP 2 I2C ERROR	OP2 I2C bus communication error
SF03	OP 31 COMM. ERROR	Communication error with OP 3 / OP C at RS232 channel 1.
SF04	OP 32 COMM. ERROR	Communication error with OP 3 / OP C at RS232 channel 2.
SF05	OP 33 COMM. ERROR	Communication error with OP HOST at RS485 channel.
SF06	PRINT COMM.ERROR	Communication error with printer connected to PACS 2000.
SF07	AUX COMM. ERROR	Communication error at AUX channel.

FLAG	SYMBOLIC NAME	EXPLANATION
SF08	RAM ERROR	RAM read / write error. The PACS 2000 RAM is tested at power up and this flag is set if faulty.
SF09	PROM ERROR	PROM checksum error. The PACS 2000 PROM is tested at power up and this flag is set if faulty.
SF10	AI ERROR	Common analog input error flag is set if any of the 32 system flags SF32 - SF63 is set.
SF11	OP 21 MASTER	First OP 2 is master. SF11 - SF15 are used for handling the master / slave concept for operator panels and are controlled by the Boolean program. One of the installed OP 2-, OP 3-, OP C- or OP HOST panels is defined as the master panel, all others are slaves. The master panel is accepted to start a program and to change the program parameters.
SF12	OP 22 MASTER	Second OP 2 is master.
SF13	OP 31 MASTER	OP 3 / OP C at RS232 channel 1 is master.
SF14	OP 32 MASTER	OP 3 / OP C at RS232 channel 2 is master.
SF15	OP 33 MASTER	OP HOST at RS485 channel is master.
SF16	PIT EXCEEDED	This flag is set if the power supply has been interrupted longer than the **P**ower **I**nterrupt **T**ime has been set to in the system configuration.
SF17	SERVICE ALARM	This flag is set if the service interval hours or sterilizer cycles set in the system maintenance menus has been reached.
SF18	STEPFLAG	If this flag is set the active subphase is ended and unconditionally performing a step to the next subphase or phase. The system resets the flag after each step.
SF19	ON OFF FLAG	Toggled every 250 ms.
SF20	BLANKTEXT	Resets all information- and error texts if set. The system resets this flag.
SF21	CYCLE EXECUTED	This flag should be set for every executed sterilizer cycle in order to increment the service interval cycle counter. The system resets this flag.
SF22	START LOG	This flag is used for starting and stopping the PACS 2000 and OP 3, OP C and OP HOST logging. It also starts and stops the graphics in process pictures.

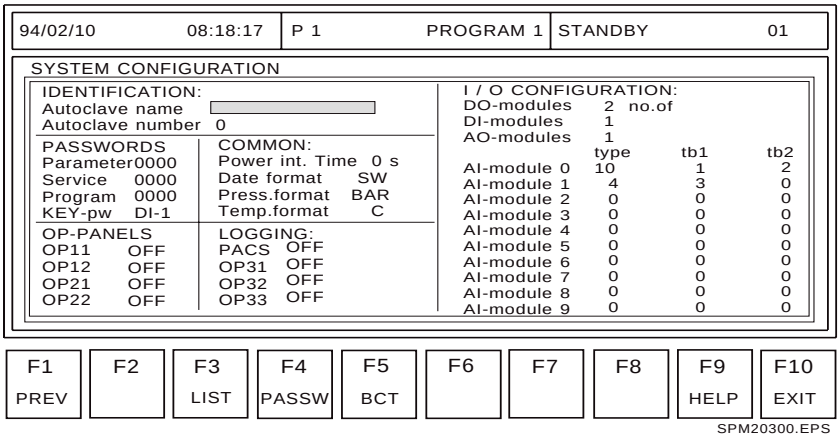
FLAG	SYMBOLIC NAME	EXPLANATION
SF23	SLOW LOG	Activates the long logging interval set in the printer definition menu.
SF24	FAST LOG	Activates the short logging interval set in the printer definition menu.
SF25	ALARM PHASE	The alarm phase PH9998 is activated if this flag is active.
SF26	BUZZER	All OP 2, OP 3, OP C and OP HOST buzzers are activated if this flag is set
SF27	BCKUP PROM ERROR	EEPROM malfunction or EEPROM missing.
SF28	PC PRINT LOG	The log sent to OP 3, OP C and OP HOST is printed if this flag is set.
SF29	PC DISK LOG	The log sent to OP C and OP HOST is stored on disk if this flag is set.
SF30	MS250 EXCEEDED	Execution time 250ms exceeded.
SF31	LOG	A log is printed out when this flag is set.
SF32	AI CH. 00 ERROR	Indicates error at an analog input channel. The flag is reset if the input is resumed.
SF33	AI CH. 01 ERROR	See SF32.
SF34	AI CH. 02 ERROR	See SF32.
SF35	AI CH. 03 ERROR	See SF32.
SF36	AI CH. 04 ERROR	See SF32.
SF37	AI CH. 05 ERROR	See SF32.
SF38	AI CH. 06 ERROR	See SF32.
SF39	AI CH. 07 ERROR	See SF32.
SF40	AI CH. 08 ERROR	See SF32.
SF41	AI CH. 09 ERROR	See SF32.
SF42	AI CH. 10 ERROR	See SF32.
SF43	AI CH. 11 ERROR	See SF32.
SF44	AI CH. 12 ERROR	See SF32.
SF45	AI CH. 13 ERROR	See SF32.
SF46	AI CH. 14 ERROR	See SF32.
SF47	AI CH. 15 ERROR	See SF32.

FLAG	SYMBOLIC NAME	EXPLANATION
SF48	AI CH. 16 ERROR	See SF32.
SF49	AI CH. 17 ERROR	See SF32.
SF50	AI CH. 18 ERROR	See SF32.
SF51	AI CH. 19 ERROR	See SF32.
SF52	AI CH. 20 ERROR	See SF32.
SF53	AI CH. 21 ERROR	See SF32.
SF54	AI CH. 22 ERROR	See SF32.
SF55	AI CH. 23 ERROR	See SF32.
SF56	AI CH. 24 ERROR	See SF32.
SF57	AI CH. 25 ERROR	See SF32.
SF56	AI CH. 24 ERROR	See SF32.
SF57	AICH. 25 ERROR	See SF32.
SF58	AI CH. 26 ERROR	See SF32.
SF59	AI CH. 27 ERROR	See SF32.
SF60	AI CH. 28 ERROR	See SF32.
SF61	AI CH. 29 ERROR	See SF32.
SF62	AI CH. 30 ERROR	See SF32.
SF63	AI CH. 31 ERROR	See SF32.
SF64 - SF127	P1 - P64	Program selection flags.
SF128	DO MOD. 0 ERROR	This flag is set if communication with the module has failed 10 times in sequence. Resets at power up.
SF129	DO MOD. 1 ERROR	See SF128.
SF130	DO MOD. 2 ERROR	See SF128.
SF131	DO MOD. 3 ERROR	See SF128.
SF132	DO MOD. 4 ERROR	See SF128.
SF133	DO MOD. 5 ERROR	See SF128.
SF134	DO MOD. 6 ERROR	See SF128.
SF135	DO MOD. 7 ERROR	See SF128.
SF136	DI MOD. 0 ERROR	See SF128.
SF137	DI MOD. 1 ERROR	See SF128.

FLAG	SYMBOLIC NAME	EXPLANATION
SF138	DI MOD. 2 ERROR	See SF128.
SF139	DI MOD. 3 ERROR	See SF128.
SF140	DI MOD. 4 ERROR	See SF128.
SF141	DI MOD. 5 ERROR	See SF128.
SF142	DI MOD. 6 ERROR	See SF128.
SF143	DI MOD. 7 ERROR	See SF128.
SF144	AO MOD. 0 ERROR	See SF128.
SF145	AO MOD. 1 ERROR	See SF128.
SF146	AO MOD. 2 ERROR	See SF128.
SF147	AO MOD. 3 ERROR	See SF128.
SF148	ENTER PASS-WORD	A demand to enter password is displayed when this flag is set
SF149	CORRECT PASS-WORD	This flag is set if the password given i correct.
SF150	PRINT LABEL	Activates the label printer.
SF151	MANUAL MODE SET	The flag is active if any DO / AO is in manual mode.
SF152	AI MOD. 0 ERROR	See SF128.
SF153	AI MOD. 1 ERROR	See SF128.
SF154	AI MOD. 2 ERROR	See SF128.
SF155	AI MOD. 3 ERROR	See SF128.
SF156	AI MOD. 4 ERROR	See SF128.
SF157	AI MOD. 5 ERROR	See SF128.
SF158:	AI MOD. 6 ERROR	See SF128.
SF159	AI MOD. 7 ERROR	See SF128.
SF160	AI MOD. 8 ERROR	See SF128.
SF16	AI MOD. 9 ERROR	See SF128.
SF162	LOG VAR. 1 - 20	The flag indicates which log group to be printed.
SF163	LOG VAR. 21 - 40	The flag indicates which log group to be printed.
SF164	LOG VAR. 41 - 60	The flag indicates which log group to be printed.
SF165	BATTERY LOW	This flag is set when the battery power is low.

FLAG	SYMBOLIC NAME	EXPLANATION
SF166 - SF167		
SF168	SUPERVISOR 1	
SF169	SUPERVISOR 2	
SF170	SUPERVISOR 3	
SF171	SUPERVISOR 4	
SF172	SUPERVISOR 5	
SF173 -. SF256		NOT USED

SYSTEM CONFIGURATION



System configuration menu

This menu defines the configuration of the PACS-system.

IDENTIFICATION

- AUTOCLAVE NAME is a 16 character long identification string used in the printer logg.
- AUTOCLAVE NUMBER is a PACS 2000 identification number used in the communication protocol. AUTOCLAVE NUMBER is also shown in the printer logg. The value must be between 1 - 99.

PASSWORDS

OPERATOR, PARAMETER, SERVICE and PROGRAM defines the passwords used in the PACS 2000 system. The password field is numeric and can only contain the digits 0 - 9.

- OPERATOR password is needed to start restricted programs and to open the door after a process failure. See further details under the heading ”Function keys” on page71.
- PARAMETER gives access to menus where program parameters can be altered.
- SERVICE password gives access to all menus except SYSTEM PROGRAMMING menus.
- PROGRAM password is the highest level and gives access to all menus in system.
- KEY-PW determines if key-password mode is enabled or not. If DI = -1 the mode is disabled else the number specifies the DI-channel that the key-switch should be connected to. Input values in the range -1 to DImax are accepted. DImax is depending on the number of DI-modules specified later in this menu. Each module contains 8 channels. Max 6 DI-modules can be specified i.e 48 channels. (See also Operator menu, PARAMETER INPUT in The Operator Manual).

COMMON

- POWER INTERRUPT TIME should be a within the range 0 - 20 sec. The entry defines the time from power failure till system flag SF16 PIT EXCEEDED is set by the control system.
- DATE FORMAT can be selected as SWedish, US or EUropean format. The operator can choose between SW/US/EU from a choice list activated by **F3**. The following formats are used:

SW	yy/mm/dd
US	mm/dd/yy
EU	dd/mm/yy

- PRESSURE FORMAT can be selected in bar, kPa or PSI format. The operator can choose from a choice list activated by **F3**.
- TEMPERATURE FORMAT can be selected in ^{o}C or ^{o}F format. The operator can choose from a choice list activated by **F3**.

OP-PANELS
These fields specifies the number of OP 1 and OP 2 panels connected to the PACS. The operator can toggle between the alternatives ON/OFF with **SPACE**.

LOGGING
These fields specifies where printer logging should be active. The operator can toggle between the alternatives ON/OFF with **SPACE**.

I/O CONFIGURATION

- DO-modules specifies the number of DIGITAL OUTPUT modules connected to the PACS. Each module contains 8 channels and max. 8 DO-modules can be connected.
- DI-modules specifies the number of DIGITAL INPUT modules connected to the PACS. Each module contains 8 channels and max. 8 DI-modules can be connected.
- AO-modules specifies the number of ANALOG OUTPUT modules connected to the PACS. Each module contains 2 channels and max. 4 AO-modules can be connected.
- AI-module 0-9 specifies the type of ANALOG INPUT modules connected to the PACS. This is done in the type-column and the entered value should be between 0 - 14, where 0 indicates no module connected. Note that, in some cases, more than one sensor type setup may be selected on the same physical AI module (a total of 11 types on 6 AI modules). Each module contains 2 - 6 channels and max. 10 modules with a total of 32 channels can be specified.

AI module types existing in the PACS 2000 system are:

TYPE	MODULE	SENSOR SETUP
1	1	3 temperature sensors type A*1
		1 pressure sensor type D
2	1	3 temperature sensors type A
		1 pressure sensor type E
3	2	3 temperature sensors type B
		1 pressure sensor type E
4	2	3 temperature sensors type B
		1 pressure sensor type D
5	2	3 temperature sensors type C
		1 pressure sensor type E
6	2	3 temperature sensors type C
		1 pressure sensor type D
7	3	6 temperature sensors type A
8	4	6 temperature sensors type B
9	4	6 temperature sensors type C
10	5	2 temperature sensors type A
		1 pressure sensor type E
		1 pressure sensor type D
11	6	4 general purpose sensors type F
14	6	2 load sensors type G
		1 general purpose sensor type F
		1 concentration sensor type H

*1. See PACS 2000 Technical Data (on Page 1) for type denominations.

The AI module type numbers 12 and 13 are reserved for other applications.

Function keys:
F1 PREV - Abort menu and skip all changes.

F3 LIST - Active choice list

F4 PASSW - Definition of password. There is a password that can be

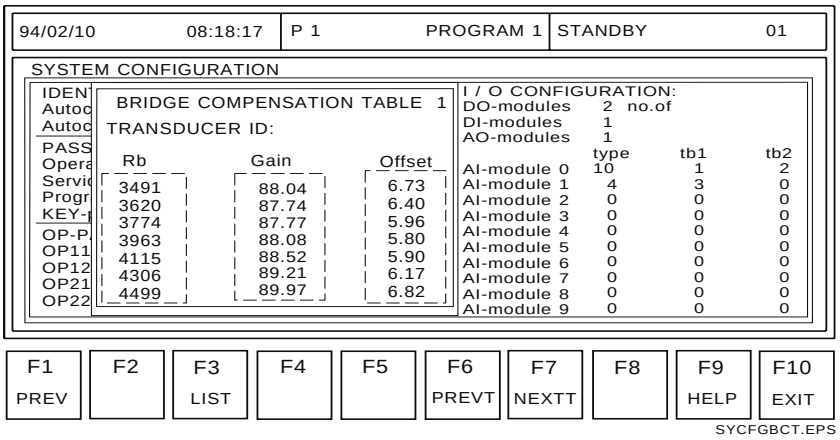
activated by the boolean program via SF148. Up to 20 unique passwords may be defined. SF149 is set when a correct password is given. The users ID is printed on the log.

F5 BCT - Activate Bridge Compensation Tables

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

BRIDGE COMPENSATION TABLES



Bridge compensation table menu

The system contains four bridge compensation tables. These are activated via **F5** in any SYSTEM CONFIGURATION field. Each table contains a field where the transducer ID consisting of 16 characters can be entered and 7 rows with **Rb**, **Gain** and **Offset** parameters. With **F6** and **F7** the operator can step between the four tables. The following ranges are accepted.

Rb	2500 - 5000 ohm
Gain	0 - 327
Offset	-99,9 - +99,9

Function keys:
F1 PREV - Leave tables and skip all changes.

F6 PREVT - Previous Bridge Compensation Tables

F7 NEXTT - Next Bridge Compensation Tables

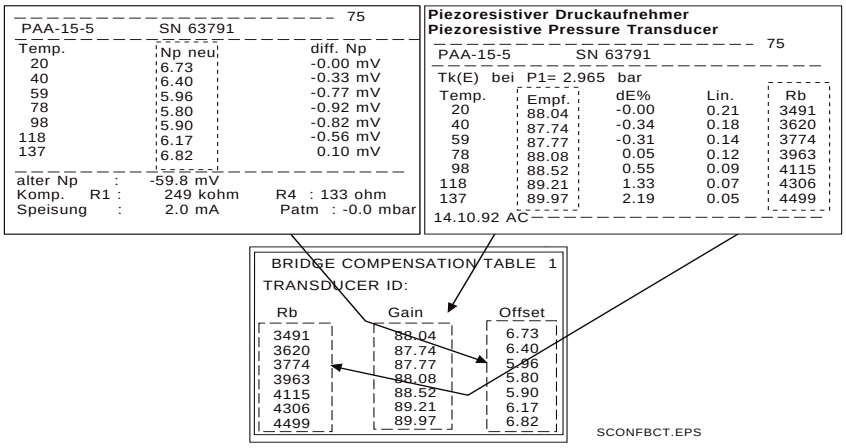
F9 HELP - Help text

F10 EXIT - Leave tables and save changes.

ABOUT ..
Pressure transducers are individually tested before delivery and are accompanied by a test individual protocol containing calibration data. This set of data is valid for one particular pressure transducer and is marked with the serial number of the transducer. The constants shall be

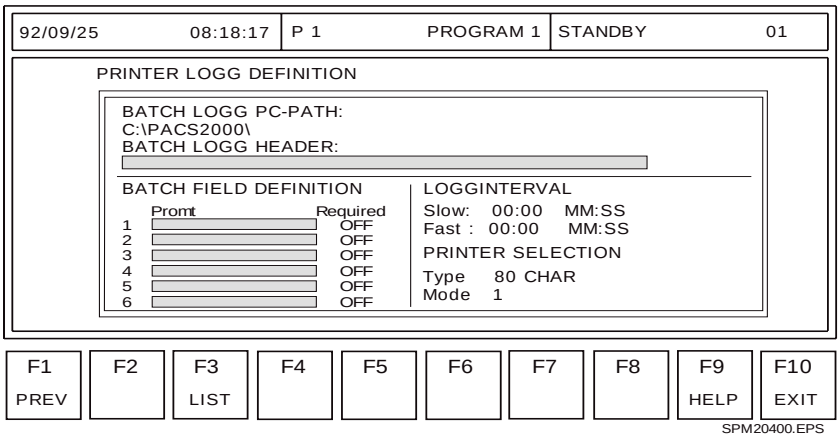
fed in to the BRIDGE COMPENSATION TABLE according to the picture below.

Each AI-module can have two bridge compensation tables assigned to it in column **tb1** and **tb2**. The system can contain up to four tables which means that the value in **tb1** and **tb2** should be between 0 - 4 where 0 indicates that no table is connected.



Pressure transducer calibration protocol

PRINTER LOGG DEFINITION



Printer logg definition menu

The Printer Logg Definition is performed in two menus, one for general data and the other for signal definition. This menu specifies the general data for the Printer Logg.

- BATCH LOGG PC-PATH defines the directory path where the printer logg is stored on disk. The field is a 60 characters long string.
- BATCH LOGG HEADER is the printer logg header text. The field is 60 characters long.
- BATCH FIELD DEFINITION defines the **prompts** for the menu BATCH DEFINITION. If a prompt is not defined the corresponding batch field in BATCH DEFINITION menu is not shown. The

Required-field specifies if corresponding batch field is allowed to be left blank. The operator can toggle between the alternatives ON/ OFF with **SPACE** when in these fields.

- LOGGINTERVALL defines the two available sample rates in minutes and seconds. Entered values should be between 00:00 -59:59 min.: sec.
- PRINTER SELECTION defines the type of printer used and required printing mode. Type is selected from a choice list of 32 CHAR, 40 CHAR COLOR, 80 CHAR, 80 CHAR COLOR and LABEL. Mode is also selected from a choice list of 1 - 4.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Display choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

ABOUT ..

The Printer Logg Definition is performed to define:

- the 60 character printer logg header
- the PC path for logging on PC disk
- the six 16 character batch field prompters definition
- the fast and slow logging interval
- the printer type
- the printing mode

The batch field prompters will appear when the operator starts a program. Each prompter is defined with a ”required” flag which is set ON or OFF.
The operator is forced to enter data at this prompter if the flag is ON.

The printer can be a:

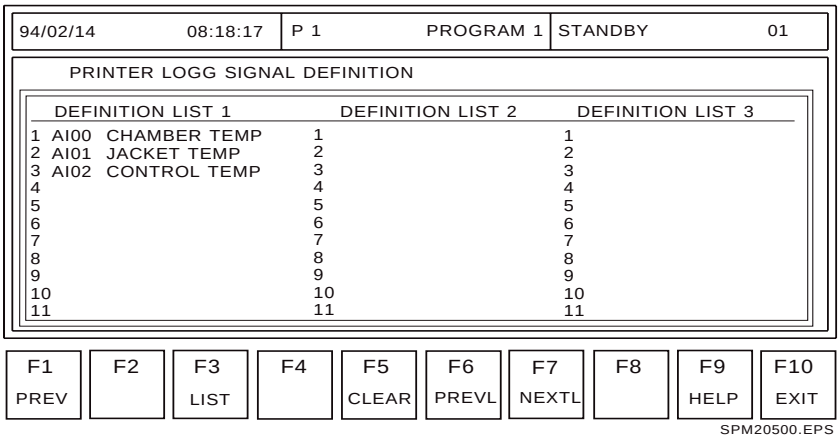
- 32 character printer
- 40 character colour printer
- 80 character printer
- 80 character colour printer
- Label printer

Printing mode can be 1, 2, 3 or 4. Mode 3 and 4 are only available with the PACS 2000 Supervisor.
Mode 1 creates a printout of batch information followed by logged values at the specified interval during the program execution.

Mode 2 creates a printout as mode 1, followed by batch information and a process diagram according to PLOT PROCESS PICTURE DEFINITION (See page78).

The PRINTER LOGG DEFINITION is done with an OP 3 or OP C.

PRINTER LOGG SIGNAL DEFINITION



Printer logg signal definition menu

The Printer Logg Definition is performed in two menus, one for general data and the other for signal definition input. This menu specifies up to 60 signals to be logged. The signals are defined in three lists that can be activated individually.

Logged signals are selected from a two step choice list where the operator can choose between defined AI, AO, F_0, CP, DF and TP functions.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F6 PREVL - Previous list

F7 NEXTL - Next list

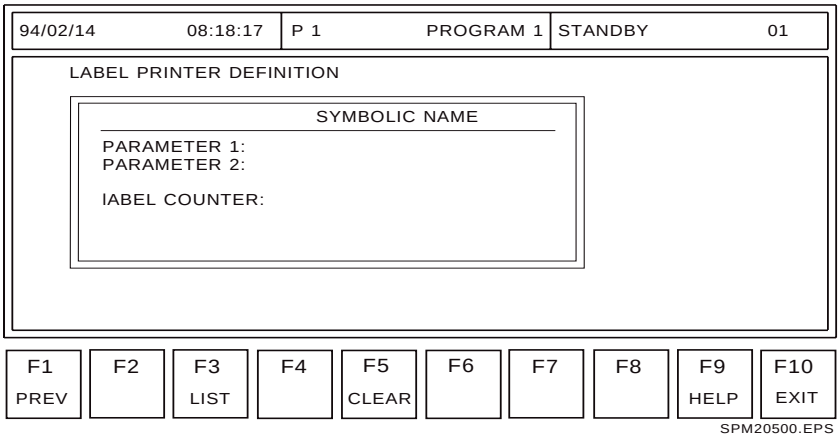
F9 HELP -Help text

F10 EXIT - Exit menu and save changes

ABOUT ..
Each column definition includes a list choice of the symbolic name for the logged signal.

The PRINTER LOGG SIGNAL DEFINITION is done with an OP 3 or OP C.

LABEL PRINTER DEFINITION



SPM20500.EPS

Label printer definition menu

This menu defines the label print-out.

Two parameters can be specifies to be printed via a two step choice list activated with **F3**. The label counter specifies the number of labels to be printed and is specified via a choice list of defined counters.

SF150 is used to activate the label print-out.

Function Keys:
F1 PREV - Abort menu and skip changes

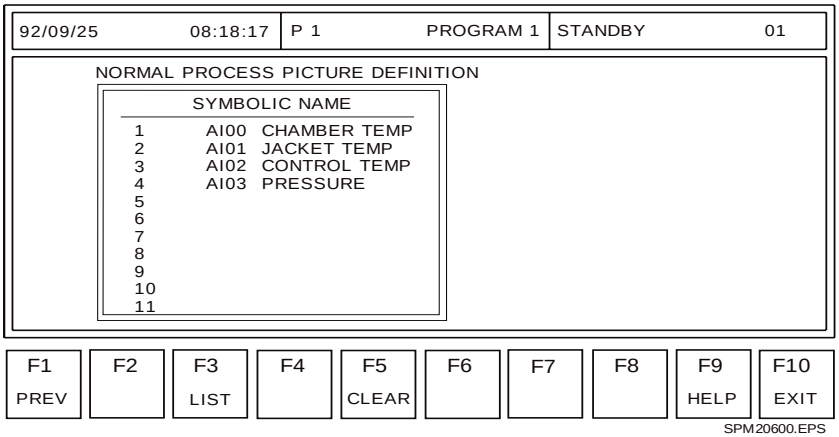
F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT Exit menu and save changes

NORMAL PROCESS PICTURE DEFINITION



SPM20600.EPS

Normal process picture menu

Two Normal process pictures exists in OPERATOR MODE (area accessible with operator password). The first 15 lines in this menu

defines the signals for column one in NORMAL PROCESS PICTURE 1. Column number one in NORMAL PROCESS PICTURE 2 is defined by the lines 16 - 30 and column number two by the lines 31 - 45 in this menu.

Process picture signals are specified via a two step choice list where the operator can choose between defined AI, AO, F0, CP, TP, DF, CP, SV, TI, CT and IT functions.

Specifying an INFORMATION TEXT (IT) makes it possible to include text strings in a NORMAL PROCESS PICTURE.

Values set in this menu is also displayed on OP 2 in menu 0400 and underlaying menus (see OPERATING MANUAL).

Function keys:
F1 PREV -Abort menu and skip all changes

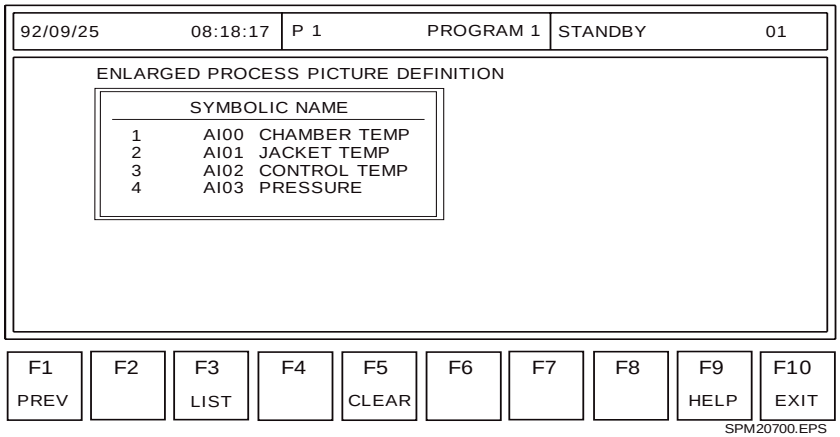
F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

ENLARGED PROCESS PICTURE DEFINITION



Enlarged process picture menu

This menu defines the content of the enlarged process picture. Max four signals can be specified. Process picture signals are specified via a two step choice list where the operator can choose between defined AI, AO, F0, CP, TP, DF, CP, SV, TI and CT functions.

Function keys:
F1 PREV - Abort menu and skip all changes

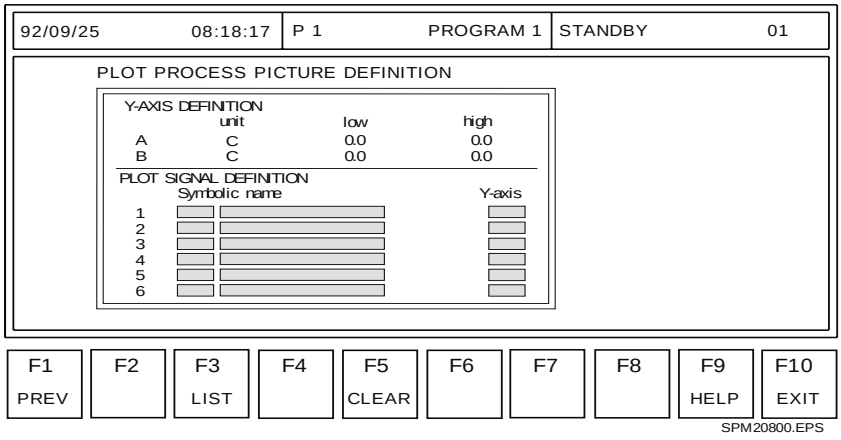
F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT -Exit menu and save changes

PLOT PROCESS PICTURE DEFINITION



Plot process picture definition menu

This menu defines the content of the plot process picture and the printed diagram. The plot process picture can contain up to six signals and two y-axis.

Y-AXIS DEFINITION
Two Y-axis can be defined, A and B. An Y-axis is defined by **unit**, **low** value and **high** value.

Unit is specified via a choice list where the operator can choose between C/F, BAR/kPa/PSI, % and F0. The unit for temperature and pressure is depending on selections made in the SYSTEM CONFIGURATION menu.

Formats and limits for **high** and **low** values are determined by the active **unit**.

UNIT	FORMAT	RANGE
C	xxx.x	0.0 - 999.9
F	xxx.x	0.0 - 999.9
BAR	x.xxx	0.000 - 9.999
kPa	xxx.x	0.0 - 999.9
PSI	xx.xx	0.00 - 99.99
%	xxx.x	0.0 - 100.0
F0	xxx.x	0.0 - 999.9

An Y-axis is as activated if the value in **high** is greater than that in

low. If Y-axis A is not activated it will not be shown in PLOT PROCESS PICTURE. If Y-axis B is not activated it is shown unmarked in PLOT PROCESS PICTURE.

PLOT SIGNAL DEFINITION
Process picture signals are specified via a two step choice list where the operator can choose between defined AI, AO, F0, CP, DF and TP functions.

Y-AXIS defines which Y-axis a signal is related to. The operator can toggle between the alternatives A/B with **SPACE** when in these fields.

Function keys:
F1 PREV - Abort menu and skip all changes

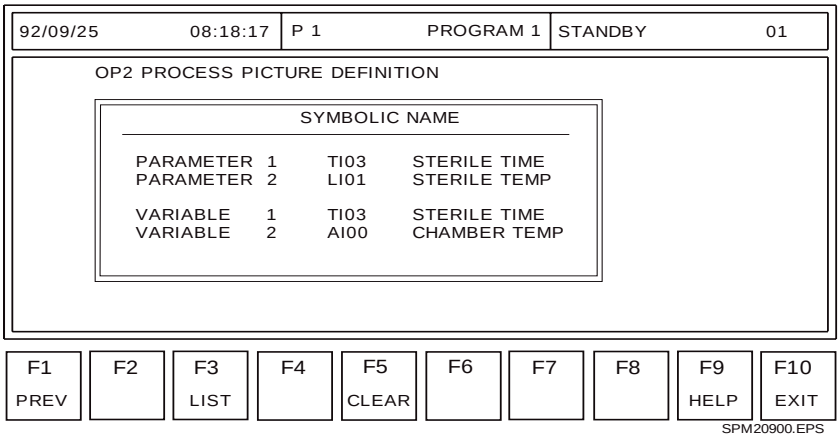
F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

OP 2 PROCESS PICTURE DEFINITION



OP 2 process picture definition menu

This menu defines the contents of the OP 2 process picture (See menu 0000 and 01000 in OPERATING MANUAL). Two parameters and two variables can be specified. The set values of the parameters are shown static while the variables are continuously updated in the OP 2 process picture.

PARAMETERS are specified via a two step choice list where the operator can choose between defined TI, CT, LI and CR functions.

VARIABLES are specified via a two step choice list where the operator can choose between defined AI, AO, F0, TP, DF, CP, SV, TI and CT functions.

Function keys:
F1 PREV - Abort menu and skip all changes

F3 LIST - Show choice list

F5 CLEAR - Clear active field

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

SAVE SYSTEM DEFINITION ON PC

This menu saves active system definition to a disk file. The file is stored with the extension ”SDF”.

FILENAME is a eight character name entered by the operator while the extension is automatically added by the system. The field is initialized with the file name from the latest read PC system definition or stored system definition.

PATH is a 60 character long field that specifies the directory where the file should by stored. Path field is initialized to the same string as in STORE PC PATH in menu PC PATH DEFINITION (See Page 86). If PATH is changed in this menu it doesn't affect any field in the PC PATH DEFINITION menu.

Save is activated with **F10**. If the file name already exists on disk a message is shown on the screen. The operator can choose to overwrite existent file or to change the file name.

Function keys:
F1 PREV - Abort storage
F9 HELP - Help text
F10 EXIT - Activate storage

LOAD SYSTEM DEFINITION FROM PC

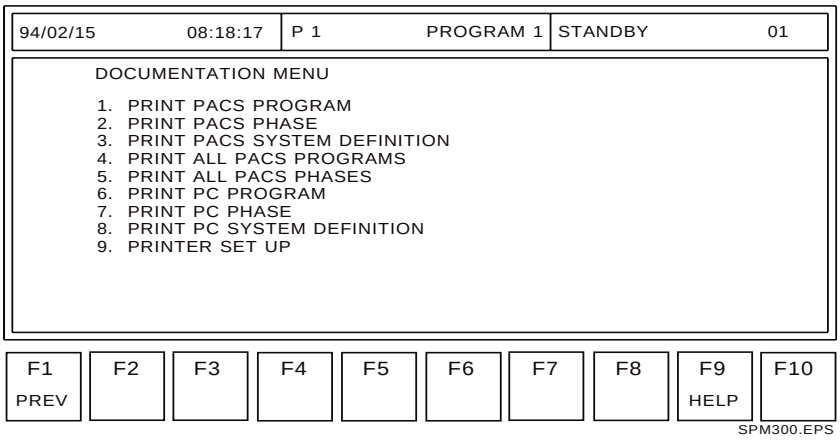
This menu reads a system definition from a disk file to OP internal variables. If OP is in ON-LINE MODE a warning message is shown that the PACS 2000system definition will be overwritten. The operator can choose to continue or to cancel the action.

A list of found system definition files is shown in a scrollable window. Active FETCH PC PATH is shown under the window. The FETCH PC PATH is defined in the menu PC PATH DEFINITION (See Page 86).

A file is highlighted with ⇧⇩ and load is activated with **ENTER**. If OP is in ON-LINE MODE the read system definitions are sent to the PACS.

Function keys:
F1 PREV - Previous menu
F9 HELP - Help text

DOCUMENTATION MENU



Documentation menu

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

Alternative 1-5 can not be activated in LOCAL MODE, while alternative 8 require LOCAL MODE.

All print alternatives on this menu means printing to a printer connected to COM 2 or LPT1 on OP C only. Printing to printer connected to PACS 2000 is not possible.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

PRINT PACS PROGRAM

This menu makes it possible to get a printout of one of the programs stored in PACS.

The menu is not available in LOCAL MODE.

PACS program directory is shown as a scrollable list. A program is highlighted with ⇧⇩ and printing is activated with **ENTER**.

Function keys:
F1 PREV - Cancel printing

F9 HELP - Help text

ABOUT ..

Every program has a name and a unique program number (PGxxxx). The name usually describes the function of the process or type of load usually sterilized in that process.
A program consists of one phase list and one parameter list. The phase list can be the same for two programs but they usually have different setting in the parameter list.

Phase list
The phase list is a list of steps (phases) that describes the total sterilizer process. The list is executed in sequence phase by phase.
Every phase has a name that describes the function of the phase and a unique number (PHxxxx).
All programs starts with the same phase called STANDY (PH0000) and ends with an interlock phase named SYSTEM (PH9999).

The names of the phases are printed on the process logg during program execution.

Parameter list
The parameter list contains the parameters (values) to all phases in the phase list. Parameters have names and a unit describing the function. All adjustable parameters are printed first at print out.

The parameters are set values for:

- CR controllers
- TI timers
- LI limits
- CT counters

A set value can be a value or a name of an other parameter in the list.

There are three types of parameters in the PACS 2000:

- A adjustable
  The parameter can ba altered by the operator within certain limits.
- I indicating
  The parameter is displayed but can not be altered by the operator.
- - passive
  The parameter is used by the program but is not displayed.

PRINT PACS PHASE

This menu makes it possible to get a printout of one of the phases stored in the PACS.

The menu is not available in LOCAL MODE.

The PACS program directory is shown as a scrollable list. A phase is highlighted with ⇧⇩ and printing is activated with **ENTER**.

Function keys:
F1 PREV - Cancel printing

F9 HELP - Help text

ABOUT ..
Every phase has a name that describes the function of the phase and a unique number (PHxxxx). The parameter list holds all parameters used in a phase and is printed without values.

The phase code list is a Boolean program consisting of instructions which describes the logic control of the process. The last condition in a subphase has to be met before the program can go on with the next subphase in the list. If the actual subphase is the last in the phase the program goes on with the next phase in the program phase list.

PRINT PACS SYSTEM DEFINITION

This menu makes it possible to get a printout of the PACS system definition.

This menu is not available in LOCAL MODE.

Printing is immediately started when the menu is activated.

Printing can be aborted with **F1**.

Function keys:
F1 PREV - Abort printing

PRINT ALL PACS PROGRAMS

This menu automatically prints all programs stored in the PACS.

Printing is immediately started when the menu is activated.

A pop-up window shows the name of the program currently being printed. It also shows the current directory number and how many programs the PACS contains.

Printing can be aborted with **F1**.

Function keys:
F1 PREV - Abort printing

PRINT ALL PACS PHASES

This menu automatically prints all phases stored in PACS.

Printing is immediately started when the menu is activated.

A pop-up window shows the name of the phase currently being printed. It also shows current directory number and how many phases the PACS contains.

Printing can be aborted with **F1**.

Function keys:
F1 PREV - Abort printing

PRINT PC PROGRAM

This menu makes it possible to get a printout of a program stored on disk. A list of found program files is shown in a scrollable window. The active FETCH PC PATH is shown under the window. The FETCH PC

PATH is defined in the menu PC PATH DEFINITION (See page86).

A file is highlighted with ⇧⇩ and printing is activated with **ENTER**.

Function keys:
F1 PREV - Cancel printing

F9 HELP - Help text

PRINT PC PHASE

This menu makes it possible to get a printout of a phase stored on disk. A list of found phase files is shown in a scrollable window. The active FETCH PC PATH is shown under the window. The FETCH PC PATH is defined in the menu PC PATH DEFINITION (See page86).

A file is highlighted with ⇧⇩ and printing is activated with **ENTER**.

Function keys:
F1 PREV - Cancel printing

F9 HELP - Help text

PRINT PC SYSTEM DEFINITION

This menu makes it possible to get a printout of a system definition stored on disk.

This menu is only available when OP is in LOCAL MODE.

A list of found system definition files is shown in a scrollable window. The active FETCH PC PATH is shown under the window. The FETCH PC PATH is defined in the menu PC PATH DEFINITION (See page86).

A file is highlighted with ⇧⇩ and printing is activated with **ENTER**. Printing can be aborted with **F1**.

Function keys:
F1 PREV - Cancel printing

F9 HELP - Help text

PRINTER SET UP

This menu sets the printer port and baud rate. The operator can choose between serial and parallel port. The baude rate alternatives are 1200, 2400, 4800 and 9600. Default is 9600 baud.

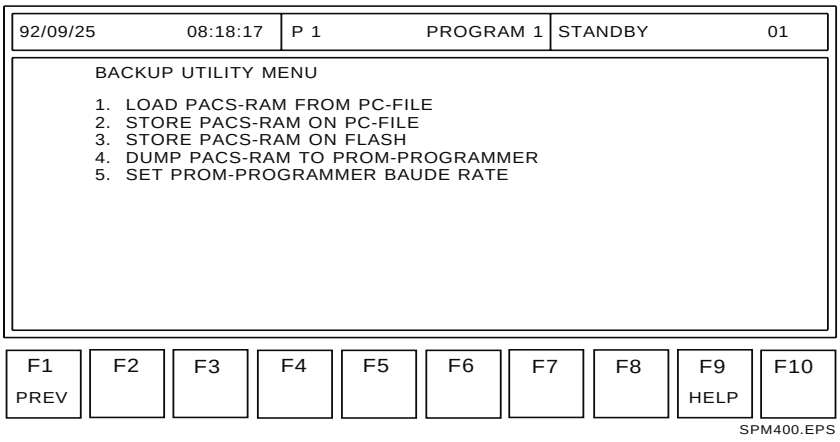
Function keys:
F1 PREV - Abort menu and skip changes

F3 LIST - Show choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

BACKUP UTILITY MENU



Backup utility menu

This menu is only available in ON-LINE MODE.

An alternative is highlighted with ⇧⇩ and selected with **ENTER**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

STORE PACS-RAM ON FLASH MEMORY

This menu commands the PACS to backup RAM-content to the FLASH memory.

N.B. FLASH memory is an option and not included in our standard delivery.

The transfer takes about 2 seconds.

DUMP PACS-RAM TO PROM-PROGRAMMER

This menu activates a transfer of PACS-RAM content via an OP C to a PROM-programmer connected to COM 2.

The PACS-RAM is 64 Kilobyte.

LOAD PACS-RAM FROM PC-FILE

This menu reads a PACS-RAM content from a disk file and sends it to the PACS. A list of found RAM-files is shown in a scrollable window. The active FETCH PC PATH is shown under the window. The FETCH PC PATH is defined in the menu PC PATH DEFINITION.

A file is highlighted with ⇧⇩ and load is activated with **ENTER**.

Function keys:
F1 PREV - Previous menu

F9 HELP - Help text

STORE PACS-RAM ON PC-FILE

This menu reads the RAM-content from the connected PACS and stores it on a disk file.

The FILENAMN is entered by the operator while the extension ”PRM” is added by the system. The field is initialized with a file name from last read PC PACS-RAM or last stored PC PACS-RAM.

PATH is a 60 character long field that specifies the directory where the file should by stored. Path field is initialized to the same string as the STORE PC PATH in the menu PC PATH DEFINITION. If PATH is changed in this menu it doesn't affect any field in the PC PATH DEFINITION menu.

Save is activated with **F10**. If file name already exists on disk a message is shown on screen. The operator can choose to overwrite the existent file or to change the file name.

Function keys:
F1 PREV - Abort storage

F9 HELP - Help text

F10 EXIT -Activate storage

SET PROM-PROGRAMMER BAUD RATE

This menu sets the baud rate for the PROM-programmer port. The operator can choose between the alternatives 1200, 2400, 4800 and 9600. Default is 9600 baud.

Function keys:
F1 PREV - Abort menu and skip changes

F3 LIST - Show choice list

F9 HELP - Help text

F10 EXIT - Exit menu and save changes

PC PATH DEFINITION

This menu defines the PC-paths to the directories where program-, phase- and system definition files are stored and fetched. The menu can be accessed from different places in the menu tree. This menu is not available in OP 3 version.

The PATH strings are 60 characters long. At start-up they are initialized to ”C:\”.

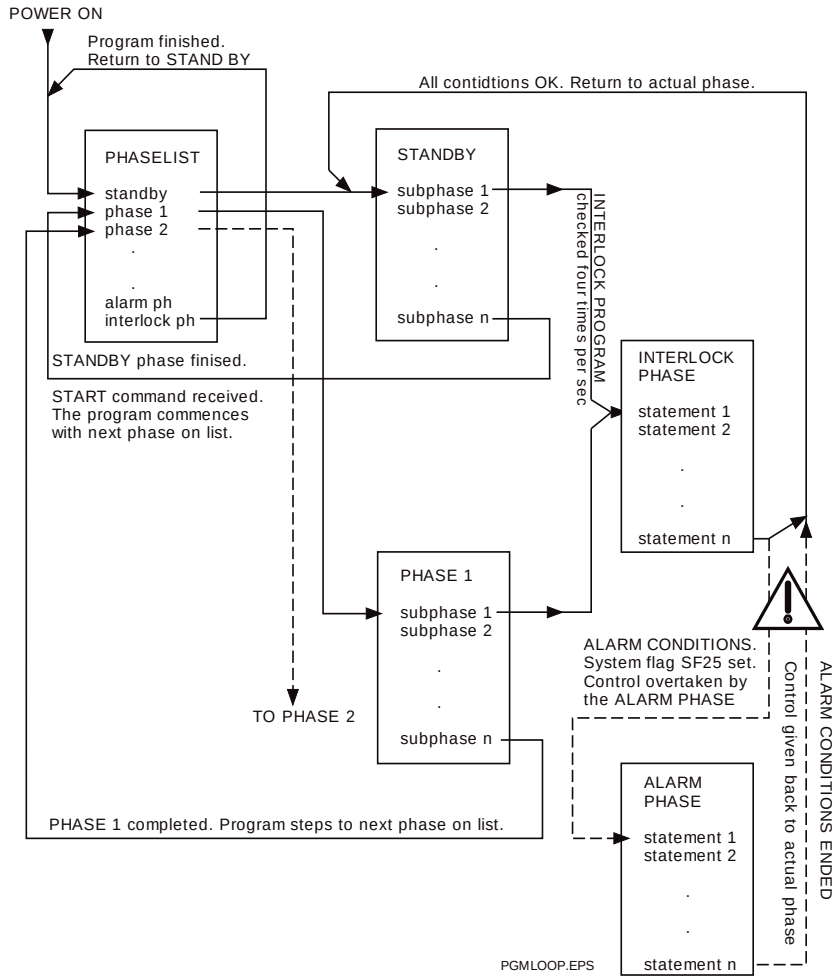
Function keys:
F1 PREV - Abort menu and skip all changes.

F9 HELP - Help text

F10 EXIT - Exit menu and save changes.

PROGRAM EXECUTION

Instructions needed by the computer to carry out a process are stored as phases in a RAM.
A phase consists of instructions written i Boolean algebra which describes the logic control of digital inputs, outputs and PACS 2000 functions.



Schematic description of program execution in PACS 2000

Each PACS 2000 process is described in a list of phases and parameters which the computer will carry out in sequences. The phases are divided into subphases and the last statement of each subphase forms a condition that has to be met before the computer goes on with the next subphase. When all subphases are carried out the next phase in the phase list will be started. As default, the first phase in the list, shall

always be a ”STAND BY” phase to which the computer returns when the last phase has been finished. All digital outputs, timers, counters, controllers, LED’s and button texts are reset at each phase shift (not valid for INTERLOCK PHASE PH9999).

The parameter list contains the parameters to all phases in the phase list including the interlock and alarm phases. The parameters may include

- set values for controllers
- ramp values for controllers
- set time for timers
- set values for counters
- set values for limiters

There are three phases with preset numbers that are treated differently:

- phase 0000 (PH0000), the STAND-BY phase
- phase 9998 (PH9998), the ALARM phase
- phase 9999 (PH9999), the INTERLOCK phase

STAND-BY PHASE EXECUTION

PH0000 is common to all phase lists in the system and shall always be placed first in the phase list of each process.

CAUTION! This phase is common to all programs. A change in PH0000 affects all programs in the system.

When this phase is active the system admits selection of a new program, which is done by setting one of the system flags SF64-127, indicating program 1 to 64.
If a new program is selected the parameters in that parameter list is activated and the new set values are written to the data base.

INTERLOCK PHASE EXECUTION

PH9999 is common to all phase lists in the system and shall always be placed last in the phase list of each process.

CAUTION! This phase is common to all programs. A change in PH9999 affects all programs in the system.

PH9999 is executed after the active subphase.The timers, counters and controllers included in the interlock phase are not reset at phase shifts.

The interlock phase supervises limit values (e.g. max. pressure and max temperature) and security conditions (e.g. closed door). The interlock phase may not include subphases.

The interlock phase may be placed anywhere in the phase list (preferably at the end). The computer will reject the execution of this phase when detected in the phase list as it is placed there only to get its parameters into the list.

ALARM PHASE EXECUTION

PH9998 is common to all phase lists in the system and shall always be placed second last in the phase list of each process.

CAUTION! This phase is common to all programs. A change in PH9998 affects all programs in the system.

PH9998 is executed after the active subphase if the alarm system flag SF25 is set.

Subphase- and phase shifts will be rejected, all active controllers are switched off and the digital outputs will be controlled by the alarm phase and not by the active subphase when the alarm phase is activated. This ”filtering” is not detected by the active subphase. The program can be continued by activating the step flag SF18.

When the alarm is reset the active subphase will resume control of the digital outputs and the controllers that where active will be restarted.

The alarm phase may not include subphases.

The alarm phase may be placed anywhere in the phase list (preferably at the end). The computer will reject execution of this phase when detected in the phase list as it is placed there only to get its parameters into the list.

PHASE CONSTRUCTION

The phase construction is done with an OP 3 or OP C in the PROGRAMMING MENU.

It is possible to start with an empty phase or an existing phase when creating a new phase. Data is entered in the phase columns with the help of function keys and list choices from pop-up windows. Functions and I/O’s will appear in the windows only if they are defined in the system and have a symbolic name. The comment field is for free editing.

The phase can be stored on a PC or in the PACS 2000. The symbolic name and the phase storage number is entered as PHxxxx when the phase is stored.

A phase can be copied simply by storing in under another name and number. It is possible to store a phase in the PACS 2000 even when a program is running and even if the same phase is running, so called ”ON LINE PROGRAMMING”.

BOOLEAN INSTRUCTIONS

The phase consists of a list of Boolean instructions grouped in subphases which are normally executed one by one starting at the first instruction. The following Boolean instructions may be used for the PACS 2000 programming:

INSTRUCTION	FUNCTION
SET	Logical 1 setting
SET NOT	Logical 0 setting

INSTRUCTION	FUNCTION
IF	Logical 1 detection
IF NOT	Logical 0 detection
AND	Logical and
AND NOT	Logical inverted and
OR	Logical or
OR NOT	Logical inverted or
IF SLOPE	Positive slope detection
AND SLOPE	Logical and with positive slope
OR SLOPE	Logical or with positive slope
AND (	Logical and with parenthesis expression
OR (	Logical or with parenthesis expression
)	End of parenthesis expression
JMP	Jump to new phase in phase list or to external phase with return
END	End of subphase
EPH	End of phase

All instructions, except for JMP, END and EPH, may use every digital status in the system as an operand:

- digital inputs
- digital outputs
- timer start, hold, out
- counter start, count, out
- controller
- analog output value
- limiter
- F0 calculator start, hold
- store value store
- alarm clock start, out
- user flags
- system flags

JMP is used with a phase number as operand and END and EPH are stand-alone instructions without operands.

A ”condition flag” is set at the start of a subphase and this flag may be

changed by an IF, IF NOT or IF SLOPE instruction.
SET and SET NOT instructions to be executed unconditionally are therefore written before conditional SET and SET NOT instructions. The ending instructions END or EPH are written last.

01	SET	DO00	Unconditional
	SET NOT	DO01	Unconditional
	IF	DI00	Condition No. 1
	SET	DO02	
	SET NOT	DO03	
	IF NOT	DI01	Condition No. 2
	END		
02	SET	DI03	

In this example DO00 is always activated and DO01 always cleared unconditionally.
DO02 is set and DO03 is cleared if DI00 is ”1”.
END will be executed if DI01 is ”0” which means that subphase 01 will be executed as long as DI01 is ”1”.
When DI01 is cleared the execution will shift to subphase 02.

SET, SET NOT

If the condition flag is ”1” the instruction will be executed. For SET instruction the operand is set to logic ”1”. For SET NOT instruction the operand is set to logic ”0”.

SET PRT

This instruction generates a print-out in the log. The printed matter is depending on the added instruction as stated below.

SET PRT TI	TI-name and actual value.
SET PRT FØ	FØ-name and actual value.
SET PRT SV	SV-name and actual value.
SET PRT IT	Information text

IF, IF NOT

These instructions controls the condition flag. For IF instruction the condition flag is set to ”1” if the operand is ”1”. For IF NOT instructions the condition flag is set to ”1”if the operand is ”0”.

AND, AND NOT

These instructions are used together with IF instructions in order to control the condition flag.

For AND instruction a logical ”and” is performed between the condition flag and the operand.

For AND NOT instruction a logical ”and not” is performed between the condition flag and the operand.

IF	DI01
AND	DO01
SET	DO02

If DI01 is ”1” and DO01 is ”1” the SET instruction is executed and DO02 is set to ”1”. Otherwise the SET instruction is skipped.

OR, OR NOT

These instructions performs a logical ”or” and ”or not” between the condition flag and the operand.

IF	DI01
OR NOT	DO01
SET	DO02

If DI01 is ”1” or DO01 is ”0” the SET instruction is executed and DO02 is set to ”1”. Otherwise the SET instruction is skipped.

IF SLOPE, AND SLOPE, OR SLOPE

These instructions works in the same way as IF, AND and OR instructions but detects a positive slope at the operand. A slope is detected if the operand status is ”1” and ”0” in the previous cycle.

The slope instructions may only be used together with digital inputs (DI) or push buttons (BU).

IF SLOPE	DI01
AND SLOPE	DI02
OR SLOPE	DI03
SET	DO01

If DI03 is ”1” and ”0” in the previous cycle or DI01 is ”1” and ”0” in the previous cycle and DI02 is ”1” and ”0” in the previous cycle the SET instruction is executed and DO01 is set to ”1”.

Otherwise the SET instruction is skipped.

AND (, OR (,)

These instructions works in the same way as AND and OR but performs logical ”and” and ”or” between the first condition and a parenthesis expression. Only one level of parenthesis expression is allowed.

```
IF          DI01
AND (       DI02
OR NOT      DI03
)
SET         DO01
```

If DI01 is ”1” and DI02 is ”1” or DI03 is ”0” the SET instruction is executed and DO01 is set to ”1”.
Otherwise the SET instruction is skipped.

JMP

The jump instruction is used with a phase number as an operand. The jump may be executed in two ways:

1. If the operand phase exists in the phase list a true jump will be executed and the program will continue from the new phase onward in the phase list.
2. If the operand phase does not exists in the phase list, the phase is searched in the PACS 2000 database and when found a jump to that phase will be executed followed by a return to the next instruction after the jump instruction.
   The return is executed at the first END or EPH instruction. This means that the operand phase can not include any subphases. If so Only the first subphase will be executed if the operand phase does contain subphases.
   If the phase operand to the jump instruction does not exists no jump is done and the next instruction will be executed.

```
IF          DI01
JMP         PH1234
IF          DI02
SET         DO02
```

If DI01 is ”1” the next phase to be executed will be phase PH1234. Otherwise the JMP instruction is skipped.

If PH1234 exists in the phase list the program will continue from that phase onward in the phase list.
If PH1234 does not exists in the phase list, PH1234 will be executed to the first END or EPH instruction after which the program will continue with the IF DI02 instruction.

END

The END instruction sets the end of a subphase.
The execution of the phase will continue with the next subphase if the condition is met.
The END is not executed and the valid subphase will remain if the condition is not met.
The END will be executed if the system flag SF18, ”STEP FLAG”, is set.

```
01    ...        ...
      IF         DI01
      AND        DI02
      END
02    IF NOT     DI03
```

If DI01 and DI02 are ”1” the execution will continue with subphase 02 otherwise subphase 01 will remain.

The subphase numbering 01-99 is added by the editor when the phase is stored.

EPH

The END is substituted by the EPH instruction at the end of the last subphase in the phase.
The execution of the phase will end and the program will continue with the next phase in the phase list if the condition is met.
The EPH is not executed and the last subphase will remain if the condition is not met.
The EPH will be executed if the system flag SF18, ”STEP FLAG”, is set.

```
      END
22    IF         DI01
      AND        DI02
      EPH
```

The execution will continue with the next phase in the phase list if DI01

and DI02 are ”1”otherwise subphase 22 will remain.

PROGRAM CONSTRUCTION

The Program Construction is done with an OP 3 or OP C in the PROGRAMMING MENU (See Page 16).

CREATE A NEW PROGRAM

FROM SCRATCH

A Name the new program by giving it a new program number and a symbolic name in the menu EDIT NEW PROGRAM (See Page 18).

B Compose a new phase list in the menu EDIT PHASE LIST (See Page 19). The phases are fetched from a list of phases existing in the PACS 2000 or on the PC at the defined PC path. The STAND-BY PHASE PH0000 should be put first and the ALARM PASE PH9998 and the INTERLOCK PHASE PH9999 preferably last.

C Edit parameters in selected phases in the menu EDIT PARAMETER LIST (See Page 20).
The parameter list is edited phase by phase. Each existing timer, counter, controller and limit is displayed for parameter entering. The parameters could be set as
a. a numeric value
b. another function set value
c. arithmetics including a. and b.

The parameter type A, I or - is also entered:
A: Adjustable by the operator within limits.
I: Informative. Readable by the operator but not adjustable.
-: The parameter is used in the program but is invisible for the operator.

D Save the program in one of or both the menus SAVE PROGRAM IN PACS (See Page 23)/ SAVE PROGRAM ON PC (See Page 24).
It is possible to store a program in the PACS 2000 when a program is running and even if the same program is running, so called ”on line programming”.

E Use RESEQUENCE PACS PROGRAM (See Page 25) to position the program where you want it.

FROM AN EXISTING PROGRAM

A Select an existing program to copy in one of the menus EDIT PC PROGRAM (See Page 17) / EDIT PACS PROGRAM (See Page

17).

B Do the desired alterations in the menus EDIT PHASE LIST (See Page 19) and EDIT PARAMETER LIST (See Page 20).

C Save the created program under a new name and a new program number in one of or both the menus SAVE PROGRAM IN PACS (See Page 23) / SAVE PROGRAM ON PC (See Page 24). The program may be stored on PC or in PACS 2000. When stored the symbolic name and program storage number i entered as PGxxxx.

D Use RESEQUENCE PACS PROGRAM (See Page 25) to position the program where you want it.

ALTER AN EXISTING PROGRAM

A Select the program to change in one of the menus EDIT PC PROGRAM (See Page 17) / EDIT PACS PROGRAM (See Page 17).

B Do the desired alterations in the menus EDIT PHASE LIST (See Page 19) and EDIT PARAMETER LIST (See Page 20).

C Save the program in one of or both the menus SAVE PROGRAM IN PACS (See Page 23) / SAVE PROGRAM ON PC (See Page 32).

WARNINGS IN THIS MANUAL

Page 8

“CAUTION! Change the passwords before putting the unit into operation (See “SYSTEM CONFIGURATION” on page 69.). Remember that programming the PACS 2000 could cause severe accidents if carried out by unqualified personnel. Do not give away level 4 password to anyone that has not been thoroughly trained in programming.”

Page 90

“CAUTION! This phase is common to all programs. A change in PH0000 affects all programs in the system.”

Page 91

“CAUTION! This phase is common to all programs. A change in PH9999 affects all programs in the system.”

Page 91

“CAUTION! This phase is common to all programs. A change in PH9998 affects all programs in the system.”

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